Economic Geography, Part. 1,2

1912

Librarian
Krishna Public Library

CONTENTS

PAGE

List of Diagrams and Maps viii

List of Illustrations xi

Key to Abbreviations xii

PART I. ECONOMIC GEOGRAPHY.

CHAP

9. The Major Natural Regions of the World 1
10. The Localisation of Agricultural Industries · Man's Clothing 35
11. Man's Food Supply 60
12. Sources of Power 113
13. Other Commercial and Industrial Materials 133
14. The Localisation of Manufacturing Industries . . 162
15. Population 191
16. Centres of Commerce and Industry 203
17. Man in many Lands 237
18. Arteries of Commerce: Land Transport 260
19. Inland Navigation and Air Transport: Cables and Wireless 281
20. Ocean Transport and World Trade 302

PART II. REGIONAL GEOGRAPHY.

21. The Continent of Europe 325
22. Northern and Western Europe 351
23. Central, Eastern and Southern Europe 379
24. The British Isles 409
25. The British Isles (concluded): The British Empire . 442
26. Asia 474
27. Africa 516
28. Oceania 552
29. North America: The United States of America, Canada and Mexico 586
30. The West Indies; Central America and South America . 624

Index 653

LIST OF DIAGRAMS AND MAPS

FIG. PAGE
82A. Rough Diagrammatic Representation of the Broad Natural Regions of Asia 2
82B. Rough Diagrammatic Representation of the Broad Natural Regions of North America 3
82C. Rough Diagrammatic Representation of the Broad Natural Regions of South America 3
83. Distribution of Deserts 5
84. Distribution of Temperate Forests 9
85. Distribution of Temperate and Tropical Grasslands . . 12
86. Distribution of Warm Marginal and Monsoon Lands . . 15
87. Distribution of Tropical Highlands and Lowlands . . 30
88. Sequence of Vegetation on Equatorial Andes . . . 32
89. The Main Cotton Belt of the U.S.A. 45
90. Raw Cotton Producing Countries 46
91. World Distribution of Sheep and Other Wool and Hair Producing Animals 49
92. World Distribution of Flax and Hemp 54
93. World Distribution of Silk 57
94. World Distribution of Cattle 62
95. European Fishing Area 68
96. North American Atlantic Fishing Area 69
97. Japanese Fishing Area 70
98. The Distribution of Wheat Production. 74
99. World Distribution of Oat Production 79
100. World Distribution of Maize Production 81
101. World Distribution of Rice Production 85
102. The Distribution of Sugar Production 91
103. "Western" Cane Sugar Exporters 93
104. "Eastern" Cane Sugar Exporters 94
105. Distribution of Tea, Coffee and Cocoa 102
106. Distribution of Fruit Production 107
107. The Approximate Situation and Extent of the Coal Resources of North America 117
108. The Coalfields of Britain and Their Leading Industries . . 118
109. The Principal Coalfields of Continental Europe . . . 119
110. Distribution of Petroleum Supplies 125
111. Iron Ore Centres of North America and Europe . . . 136
112. The Principal Gold-Producing Regions of the World . . 142
113. The Principal Woodlands of the World 149
114. The Coniferous Forest Area of Europe 151
115. Asiatic Rubber Producers 158
116. Lancashire Cotton District 170
117. The Yorkshire Woollen District and the Surrounding Area . 173
118. The Influence of Rainfall on Population Density in the Tropics 192

FIG. PAGE

119. The Influence of Coal on Population Density in Britain . 193
120. The Site of London 210
121. London as a Route Centre 211
122. The Position of Southampton 212
123. The Position of Liverpool 213
124. Paris—A Route Centre 214
125. Berlin—A Route Centre 216
126. Hamburg's "Continental Outlook" 217
127. Antwerp, Amsterdam and Rotterdam 218
128. The Situation of Oslo, Stockholm and Copenhagen . . 219
129. Danzig, The Outlet for the Vistula Basin 220
130. Prague and Vienna 221
131. The Situation of Istanbul (Constantinople) 222
132. Cairo and Alexandria, the Ports of the Nile Valley . . 223
133. The Situation of Cape Town 224
134. The Position of Montreal 225
135. The Position of Winnipeg 226
136. The Position of Vancouver 227
137. The Sites of New York and of Chicago. 228
138. The Position of San Francisco 229
139. The Situation of the Chief Ports of India and Their Main Railway Connections 232
140. The Ocean Routes Converging on Colombo, Singapore, Hong Kong and Shanghai 233
141. The Importance of Sydney and Melbourne 235
142. Orient Express Route 270
143. The Main Railway Lines of the British Isles 271
144. The Main Rail and River Routes of Africa 274
145. The Principal Railways of Australia 275
146. The Main Rail and River Routes of South America . . . 279
147. Navigable Waterways of England 285
148. The Navigable Waterways of France 287
149. The Navigable Waterways of Germany 288
150. Cable Communications and some Leading Wireless Stations . 299
151. The Hinterland of Hull 307
152. Principal Ocean Trade Routes 314
153. The Panama Canal 321
154. Relief of Europe 328
155. Europe—Temperature in °F. Reduced to Sea-Level . . 333
155A. The Natural Regions of Europe 339
156. Europe—Railways (Showing Alpine Passes) 348
157. Scandinavia—Climatic Influences 352
158. Belgium's Industrial Area 362
159. Routes of Southern France 369
160. The German Rhine 374
161. The Natural Regions of European Russia 384
162. Outlets of Czechoslovakia 391
163. Routes of Northern Italy and the Alps 401
164. The Continental Shelf of Europe 410
165. The Mean Annual Rainfall of the British Isles 419
166. Routes and Towns of the Central Lowlands 444
167. Routes, Gaps and Industries of Northern England . . . 446
168. The Position of Newcastle 449
169. Gaps Utilised by the Routes Radiating from London . . 456
170. Comparative Areas of the British Empire and the Rest of the World 468

FIG. PAGE
171. Comparative Areas of the Countries of the Empire . . . 468
172. Comparative Populations of the British Empire and the Rest of the World 469
173. Comparative Populations of the Countries of the Empire . 469
173A. Natural Climatic Regions of Asia 477
174. Trans-Siberian Railway 480
175. Iraqi and Persian Oilfields 484
176. Passes of N.W. India 488
177. Passes of the Western Ghats 490
178. Rainfall of India 491
179. Agricultural Products and Exports of India and Ceylon. . 494
180. Japan 509
181. Mean Annual Rainfall of Tropical Africa 519
181A. Natural Regions of Africa 521
182. Broad Natural Regions of the Union of South Africa . . 526
183. The Principal Railways of the Union of South Africa . . 530
184. Mean Annual Rainfall of Australia 555
184A. Natural Regions of Australia 557
185. Mean Annual Rainfall of New Zealand. 575
186. The Principal Railways of New Zealand 576
187. The Position of Wellington 580
188. Mean Annual Rainfall of Canada. 593
188A. Natural Regions of Canada. 594
189. Atlantic Outlets for Canadian Grain 597
190. Natural Regions of the United States 613
191. Natural Regions of South America 634
192. Principal Coffee Belt of Brazil 642
193. The Meat and Grain Area of South America 647

LIST OF ILLUSTRATIONS

PAGE

A Stretch of Farming Country, Lake St. John, Quebec 11
Clearing Land in New South Wales 17
An Artesian Bore in South Australia 38
The Huge Hydro Electric Power Station at the Foot of the Montgomery Falls (Montreal) 129
Sluicing for Gold in Victoria 143
The Premier Diamond Mine at Pretoria 146
Tapping a Rubber Tree in Sierra Leone, W. Africa 157
A Huge Canadian Pulp and Paper Works at Grand Mère . . 188
A Labrador Fur Trapper Off on his Round 240
A Log Jam on a Canadian River 243
Milking Time in a Persian Nomad Camp 246
Shelling Rice by Primitive Methods 251
Ancient Transport for Modern Purposes 265
Vineyards Clothe the Closely Terraced Hill Slopes of the Upper Rhine Valley 371
An Indian Treadmill used for Irrigation 493
A Native Market at Lahore 499
In Japan, Rice Cultivation is Vital Work 508
One of the World's Greatest Sources of Gold: The Crown Mines of Johannesburg 533
Transport in Abyssinia 540
The Fertile Nile 'mid the Barren Wastes of Egypt 542
The Burrinjuck Dam, Murrumbidgee Irrigation Area, N.S.W. . . 558
Loading Wheat at Melbourne 561
Harvesting with Reaper and Binder, N.S.W. 568
Shearing Time at Hawke's Bay, New Zealand 579
Huge Grain Elevators at Fort William, Ontario 596
A Valley of Oil Fields in Alberta 605
Branding Cattle in Montana, U.S.A. 611
The Panama Canal 630

KEY TO ABBREVIATIONS USED IN THE EXAMINATION QUESTIONS

B.U.	Bristol University.
C.C.S.	Corporation of Certified Secretaries.
C.I.I.	Chartered Insurance Institute.
C.I.S.	Chartered Institute of Secretaries.
C.S.	Civil Service Commission.
C.S.C.	Cambridge Schools Certificate.
C.W.B.	Central Welsh Board.
D.S.C.	Durham Schools Certificate.
D.U.	Durham University Matriculation.
I. of B. Qual.	Institute of Bankers, Qualifying.
I. of B. P.I.	do. do. Part I.
I.C.W.A.	Institute of Cost and Works Accountants.
I.S.A.	Incorporated Secretaries Association.
L.A.A.	London Association of Accountants.
L.C. of C.	London Chamber of Commerce.
L.G.S.	London General Schools Certificate.
L.M.	London University Matriculation.
N.U.	Northern Universities Matriculation.
O.L.	Oxford Local.
O.S.L.	Oxford Schools Leaving Certificate.
O. & C.J.B.	Oxford and Cambridge Joint Board Matriculation.
R.S.A.	Royal Society of Arts.
S.A.A.	Society of Incorporated Accountants and Auditors.

PART I

ECONOMIC GEOGRAPHY

CHAPTER 9

NATURAL REGIONS OF THE WORLD

A careful study of geographical factors shows that it is possible to divide the world into a number of types of so-called *Natural Regions,* each type comprising all those regions of the world which have fairly uniform geographical characteristics.

The number of distinctive types of natural region is reasonably limited, and this very greatly simplifies the detailed study of the geography of the world. Any particular type of region may be found in areas which are very widely separated, but in all areas of the same type the climate, the vegetation, animal life and the occupations of the people tend to be similar. On the basis of this similarity we can, for instance, group together as one type of natural region such widely separated areas as parts of Africa, of North and South America, of Europe and of Australia.

The most important factors which lead to similarity in regions of the same type are latitude, physical features and situation in relation to the land masses. Minor differences can usually be ignored although, in some cases, the variations (usually in relief) in any one region may be so great that we often find a certain type of region with one or more smaller regions of a different type lying within its boundaries. Natural regions do not, of course, conform to political boundaries nor are they as clearly and definitely bounded as are political divisions. On the contrary, one natural region may embrace the whole or parts of quite a number of different countries, while the different regions merge gradually into one another. Frequently, indeed, the change from one region to another is so gradual that between two regions lies a "transitional" area which exhibits the characteristics of both regions.

The study of natural climatic regions is of great practical importance, for the lands in each region lend themselves to similar lines of development, and the recognition of a new area as a member of a well-known type enabled man to attack the problem of its development with the minimum waste of time and capital. For example, it was found some years ago that Malaya belonged to the same type of natural region as those parts of Brazil which produce the best wild rubber, and recognition of this fact led to the introduction of rubber cultivation in the Malay Peninsula, which has since become the greatest rubber-growing region in the world.

As natural regions merge gradually into one another, it is not possible to describe them in, as it were, watertight compartments. Different writers therefore adopt different schemes of grouping, but the scheme in this book follows closely that of the late Professor Herbertson, who was mainly responsible for the division of the world into climatic groups. The classification we shall adopt is as follows :—

Polar Regions :

ICE-CAP TYPE.
TUNDRA TYPE.

Cold Temperate Region :

TAIGA TYPE.

Cool Temperate Regions :

WESTERN MARGINAL TYPE.
EASTERN MARGINAL TYPE.
INTERIOR LOWLAND TYPE.
INTERIOR HIGHLAND TYPE.

Warm Temperate Regions :

WESTERN MARGINAL TYPE.
EASTERN MARGINAL TYPE.
INTERIOR LOWLAND TYPE.
INTERIOR HIGHLAND TYPE.

Tropical Regions :

HOT DESERTS.
EASTERN TROPICAL LANDS.
MONSOON LANDS.
TROPICAL PLATEAUS.
EQUATORIAL LOWLANDS.
EQUATORIAL PLATEAUS.

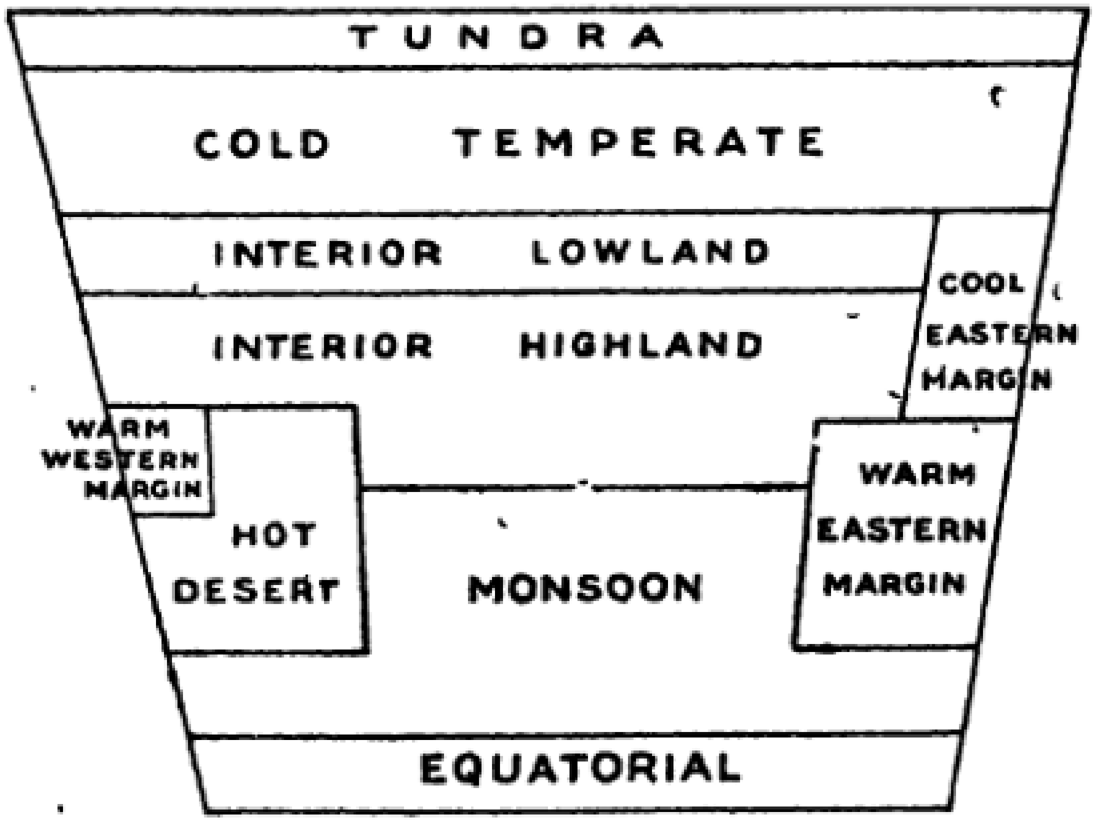


FIG. 82a: ROUGH DIAGRAMMATIC REPRESENTATION OF THE BROAD NATURAL REGIONS OF ASIA.

We shall see later that examples of several of the above regions are present in each of the continents, but in no continent is there an example of all the regions, the nearest approach being North America which lacks only the equatorial types. Figs. 82a, 82b and 82c show very roughly in diagrammatic form the broad natural regions of the Americas and Asia.

POLAR REGIONS

Ice-Cap Type

Lands of this type, perpetually covered with snow and ice, are of little economic importance. They include a large part of the Antarctic continent and of Greenland, and the majority of the islands to the north of Canada. The weight of the accumulated snowfall converts the lower layers of snow into ice, which is gradually forced outwards, until from the fringes large masses break away in the form of icebergs.

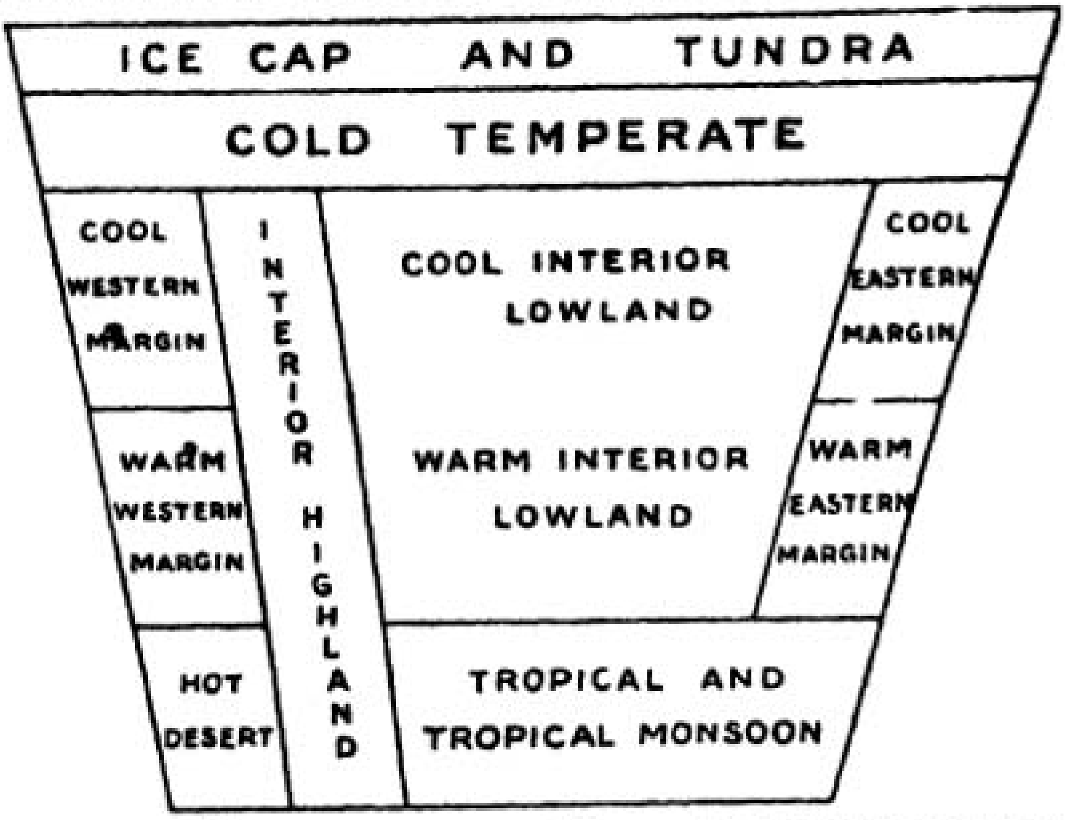


Fig. 32b: Rough Diagrammatic Representation of the Broad Natural Regions of North America.

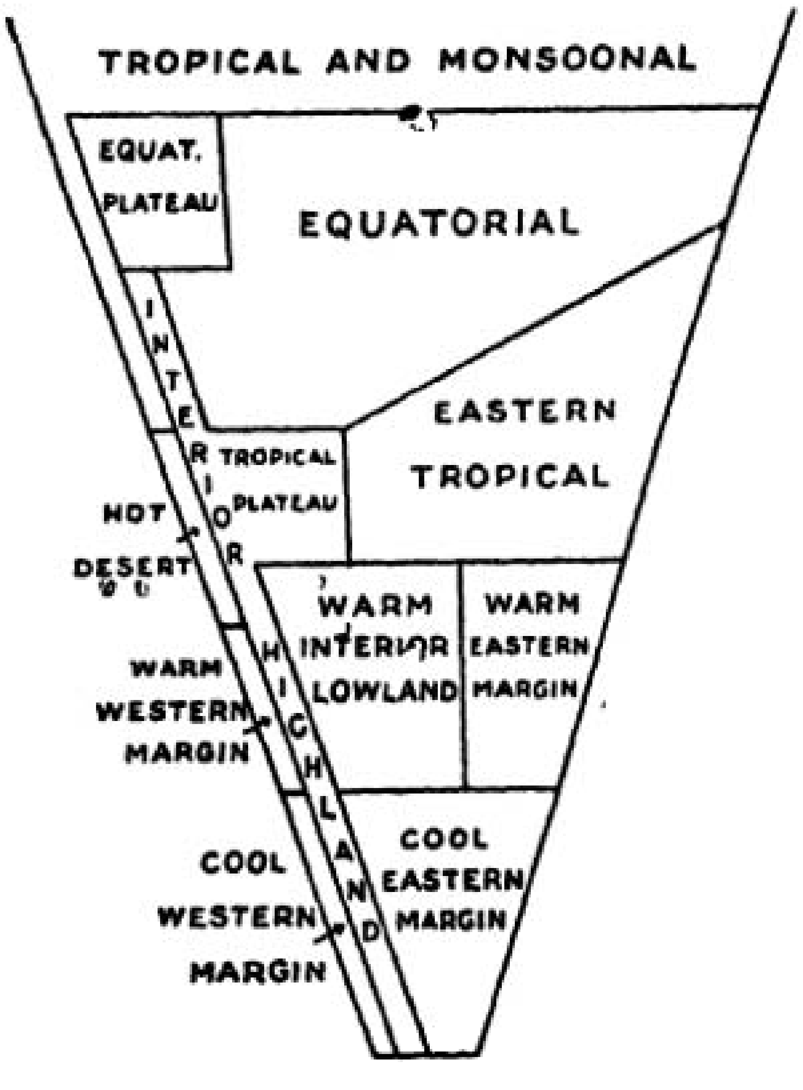


Fig. 82c: Rough Diagrammatic Representation of the Broad Natural Regions of South America.

The work of intrepid explorers such as Shackleton, Scott, Admiral Byrd and Sir Hubert Wilkins is gradually extending our knowledge of the Arctic and Antarctic regions, and, with the aid of up-to-date appliances such as aeroplanes, accurate maps of large areas are being built up. Throughout this region, the winter is one long night extending for six months of the year, while the " summer " is a similar period of continuous daylight without much warmth. Animal life is confined chiefly to penguins, whales, seals and fish, but life for man is impossible for any length of time, despite the scientific devices and implements now at his disposal. On the coast of western Greenland the Eskimos do manage to eke out a precarious living by hunting polar bears, seals, walruses and fish, while in the summer the waters of the northern ice-cap regions provide a hunting ground for the whaling fleets of Britain and other countries.

Tundra Type

The Tundra includes the lowlands bordering the Arctic Ocean and extends, for the most part within the Arctic Circle, completely across the mainland of North America and Eurasia (Fig. 83). In winter, the Tundra is really a vast cold desert, where frost prevails for about eight months and there is a little snow but no rain. The ground is permanently frozen to a depth of a few feet, but in the short summer the surface thaws and the soil becomes a marshy waste whereon quickly growing vegetation such as mosses, lichens, small shrubs and berry-bearing bushes like the cranberry, make the best of a short existence. At this time daylight is almost continuous, and in favoured places --especially sheltered hollows—brilliant flowers burst into life, completely transforming an otherwise bleak expanse into a feast of beauty and colour. At this time the vegetation is capable of supporting the many animals which flock to the region, and, as some of these furnish useful skins and valuable furs, they are sought after by nomadic hunters who are largely dependent on them for a precarious livelihood.

Stefansson, the famous Canadian explorer who has done so much to reveal the possibilities of the north of Canada, writes, " the Arctic grass-lands have caribou (the American reindeer) in herds of tens of thousands and sometimes hundreds of thousands to a single herd, with less numbers of musk oxen here and there. Wolves that feed on the caribou go singly and in packs of ten or less, and their aggregate numbers on the Arctic prairies of the two hemispheres must be well in the tens of thousands. There are the polar foxes, both white and blue, that feed in summer on the unbelievable swarms of lemmings that also form the food of hundreds of thousands of owls, hawks and gulls. There are the goose and brant and swan and crane and loon and various species of duck. The ground in the moulting season in some islands, such as Banks Island, three or four hundred miles north of the Arctic Circle, is literally white with their moulted feathers a little later in the season when the birds are gone. When you add to this picture the bumble bees, blue-bottle flies, and abundant insect life, of which the clouds of mosquitoes form the most impressive and least tolerable part, you get a picture of a country that in summer is not without life."

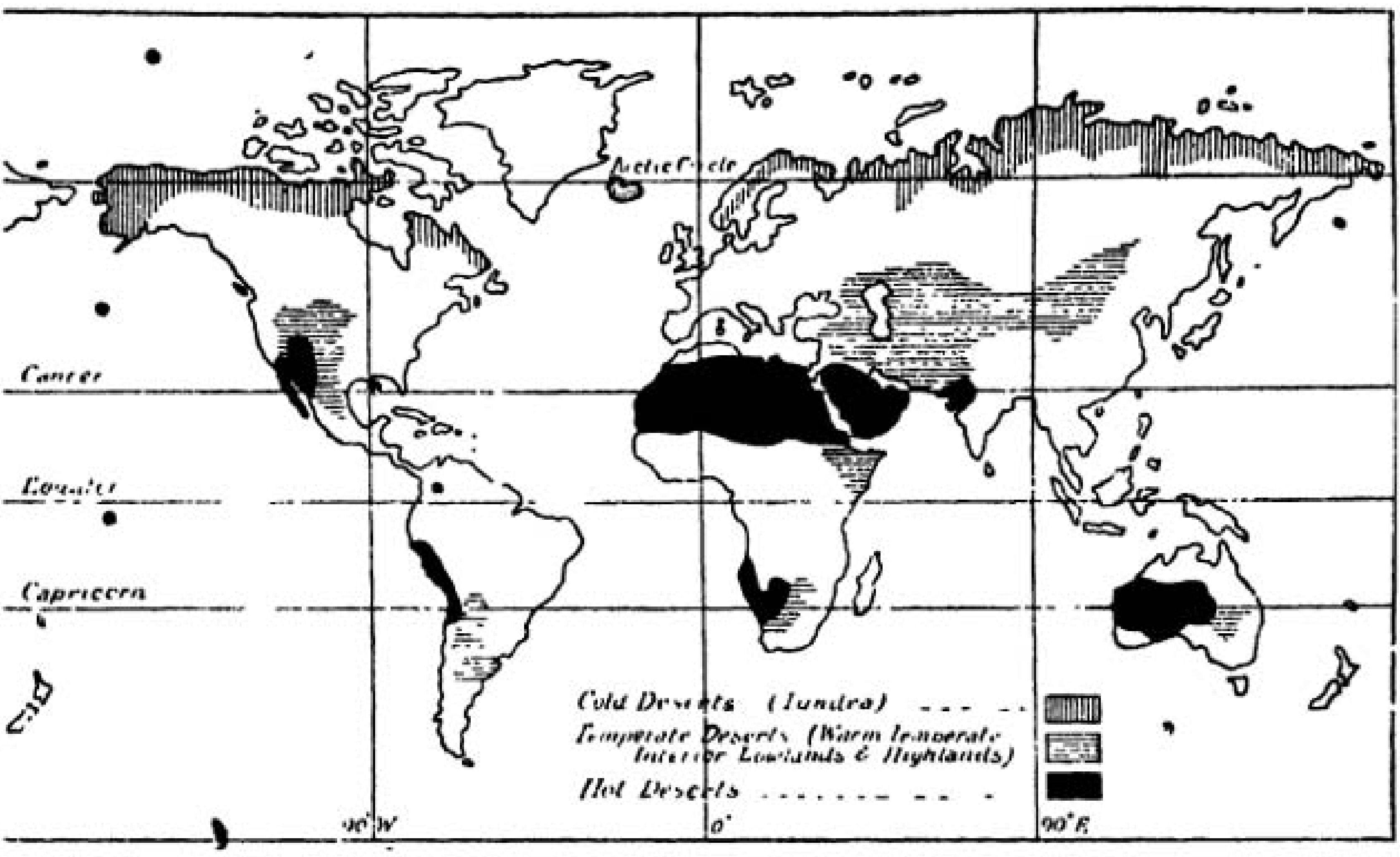


FIG. 83: DISTRIBUTION OF DESERTS.

It is noteworthy that Stefansson regards the Canadian tundras as a valuable future source of meat supply. At present, however, the region is of little economic importance except in areas where minerals are found, such as the Yukon, which has gold supplies, the island of Spitzbergen, which yields coal, and the Mackenzie valley where oil abounds. As the ground never thaws deeper than a foot or so, cultivation is impossible and the Eskimos of Northern Canada, like the Samoyeds, Ostyaks and Tunguses of Northern Siberia, are all hunters and fishermen. In Canada the Eskimos hunt foxes, bears and other fur-bearing animals, as well as birds and seals. Fishing is more developed in the Siberian rivers, while the Lapp lives almost exclusively on reindeer and on berries collected in the short summer.

Clearly, the reward for human labour is very small in the Tundra, and it is for this reason that these regions have been aptly called *Regions of Privation*. Man has a continuous struggle for existence and the standard of life is extremely low.

COLD TEMPERATE REGION

Taïga Type

The Taïga is a large belt of coniferous forest immediately south of the Tundra, the most important areas being in Canada, Scandinavia, Finland and Soviet Russia (Fig. 84). With the exception of the mountains of New Zealand and the extreme south of South America, which are unimportant, there is no example of the Taïga in the Southern Hemisphere.

The coniferous belt experiences a very long and cold winter during which the period of light is very short, although the winter is neither as long nor as cold as that of the Tundra. In the short summer, when the period of daylight is very long, the temperature rises to over 60° F. in places, so that the annual range of temperature is very high.

Ottawa (Canada), 300 feet above sea-level, has a mean January temperature of 12°F. and a July temperature of 70°F., whilst *Yakutsk* (Siberia), 330 feet above sea-level, has a January temperature of −46°F. and a July temperature of 66°F., or an average annual range of 113°F. between winter and summer. At *Trondhjem* (Norway), on the other hand, sea influences lower the yearly range to 30°F. (27°F. in January and 57°F. in July).

Precipitation, even including the heavy falls of snow, is slight, the average yearly rainfall being below 20 inches, with the period of maximum rainfall usually in the summer months. The low temperature prevents rapid evaporation, however, with the result that a rainfall of 10 inches during the year is sufficient for tree growth. Trondhjem, due to its proximity to the sea, and Ottawa, due to its nearness to the Great Lakes, are exceptional in that their average rainfall is over 30 inches a year, but at Yakutsk the yearly average is only 13 inches, while at *Verkhoyansk* (Siberia) it is below 4 inches.

The trees of the coniferous forests, with the exception of larch, are evergreens. They have downward sloping branches, which throw off the snow that would otherwise break them down, and their leaves, instead of being large and flat as in the case of deciduous trees, are long-pointed, thick and resinous, being thereby adapted to withstand cold and to minimise transpiration. Intermingled with conifers such as pine, fir, hemlock, deal and larch, is the birch, the one deciduous tree of this region.

These forests, particularly those of North America (the most important), Norway, Sweden, Finland and Russia, are the world's great reserves of soft woods. Belts of pine forest stretch from Alaska to the St. Lawrence, and from Norway to eastern Asia. Throughout this region wherever the forests are accessible lumbering is an important industry, especially at places which are near navigable rivers for transporting the logs or near waterfalls for driving the saw and pulp mills, as is the case in Eastern Canada and North-Western Europe. In Asia, the forests are largely inaccessible and as a result of the extensive flooding of the land which follows the melting of the upper courses of the rivers whilst the lower courses are still frozen, the timber is of poor quality.

As there is more food and shelter in the forest than in the adjoining regions during the winter, the Taïga is a refuge for deer and a hunting ground for the wolf, stoat, ermine, badger and other animals. Consequently, where the forests have not been cleared, the primitive occupations of deer-hunting and the trapping of fur-bearing animals are carried on. In the warmer forest clearings to the south agriculture is practised, particularly in Canada and European Russia. The hardier cereals, oats and rye, are cultivated, while cattle and sheep are reared. In regions where ordinary lumbering is uneconomic, wood distilling is carried on to yield turpentine, resin, creosote and wood tar, which are exported during the few weeks that the river mouths are free from ice, *e.g.*, in the Irtish valley in the Tobolsk district of eastern Siberia.

The Taïga, not very far removed in its climatic characteristics from the region of privation, is well described as a *Region of Great Effort.*

COOL TEMPERATE REGIONS

Western Marginal Type

Lands of this type are usually situated on the western margins of the continents above lat. 45°. They include N.W. Europe (excepting Scandinavia), N.W. North America (excepting Alaska), S.W. South America, Tasmania and the South Island of New Zealand (Fig. 84). The climate is *oceanic*, and for this reason these areas are known as the *Oceanic* or *West European* type of natural region.

Although we may find in these areas differences in structure and in commercial development, the factor they have in common is an equable climate with an adequate rainfall throughout the year, but with a maximum in the autumn and winter, and a falling off from west to east. The winds are chiefly westerly all the year round, blowing from over wide expanses of ocean, while, in the Northern Hemisphere, warm ocean currents and drifts maintain ice-free ports and help to ensure a long growing season. In all the western marginal areas the temperature is seldom above 60° F. for any long period, and the range of temperature between summer and winter is nowhere great. Differences in relief naturally cause local variations in climate as, for example, in British Columbia, where the windward slopes of the mountains receive a heavy rainfall whilst the leeward slopes are frequently dry and have to be irrigated to support crop growth.

In Central Europe, there is a region which is really a transition area between the western marginal type and the cool interior lowland region. The climate is a little more extreme than the true West European type, the average temperature in the coldest months falling below freezing point and the maximum rain being received during the summer. This region is known as the *Central European* type, and it includes, for example, the North German Plain. The remaining part of Europe which belongs to the West European climatic region is sometimes referred to as the *N.W. European type.*

London, situated almost at sea-level, has a mean annual temperature of 39°F. in January and 64°F. in July, and an annual rainfall of 25 inches. *Hokitika* (N.Z.), also at sea-level, has a July temperature of 45°F. and a

January temperature of 60°F., with a yearly rainfall averaging 115 inches. The difference in the winter temperature is accounted for by the fact that New Zealand is influenced by the sea even more than Britain and that Hokitika is nearer the Equator, whilst the great difference in rainfall is due to the position of Hokitika on the windward side of mountains. *Paris* (France), 160 feet above sea-level, has a temperature of 36°F. in January and of 65°F. in July, the greater range being due to its situation farther inland. The rainfall of the city averages about 21 inches yearly. *Kamloops* (British Columbia), nearly 1,200 feet above sea-level, is not exposed to the ameliorating influences of the ocean as it is shut off by high mountains. It thus has a greater range of temperature than is usual in this region (from 25°F. in January to 70°F. in July) while its yearly rainfall has a comparatively low average of about 10 inches, because the winds are robbed of their moisture by the mountains before they reach the district. *Valdivia* (Chile) has a range of temperature and an average yearly rainfall similar to that of Hokitika and for much the same reasons.

Generally speaking, and considering the region as a whole, the range of temperature increases as we go inland, whereas the average yearly rainfall decreases; and, as the winds are rain-bearing and warm, altitude and position in relation to mountains have an important influence on local climate.

These western margins of the cool temperate zone, with their oceanic type of climate, are characterised by *temperate deciduous forests* of oak, beech, elm, maple and birch. In comparison with conifers, these woods are hard. The leaves, which are green and broad, are shed during the autumn, or "fall", and so the trees, which are easily injured by frost, protect themselves against undue loss of heat by radiation and conduction. Conifers, particularly the pine and eucalyptus, intermingle with the deciduous trees in the higher lands, the former more especially in North America and the latter principally in Tasmania.

Although the natural vegetation of this region is of the forest type, the forests have been extensively cleared to make way for agriculture and pasture. Cereals, fruits, roots and other fodder crops, hemp and flax are raised, sheep are reared for wool and mutton, and cattle for beef and dairy produce. Cattle production is general in N.W. Europe, but actually the main occupations bear little relation to the climate and vegetation, since they are primarily based on the great mineral wealth of the area. Lumbering is an important industry in British Columbia, while cattle-rearing, fishing and fruit-farming also are extensively practised. Tasmania depends more on minerals than on agriculture, with fruit-farming as the basis of her only important manufacture—jam-making. Sheep-rearing is important in the South Island of New Zealand, but there are extensive forest areas still untouched. S.W. Chile is almost virgin forest, although there are fishing communities along the coast, as indeed is the case in all these lands, which have indented coastlines and an extensive continental shelf.

Clearly, there is yet room for considerable development in British Columbia, Tasmania, New Zealand and Chile, where the great potentialities have by no means been fully realised.

The climate experienced by the western marginal lands in the cool temperate zone is most favourable to human activity, human occupations being rarely suspended through climatic causes either in winter or in summer. Besides, it is considered by physiologists that the rapid changes of temperature experienced by these marginal lands not only from day to day but almost from hour to hour have a pronounced stimulating effect on the people, bracing their nerves and galvanising them into constant action. The people, therefore, tend to be virile and industrious, and the energy expended by them is amply rewarded—hence the term *Regions of Effort* sometimes applied to these areas.

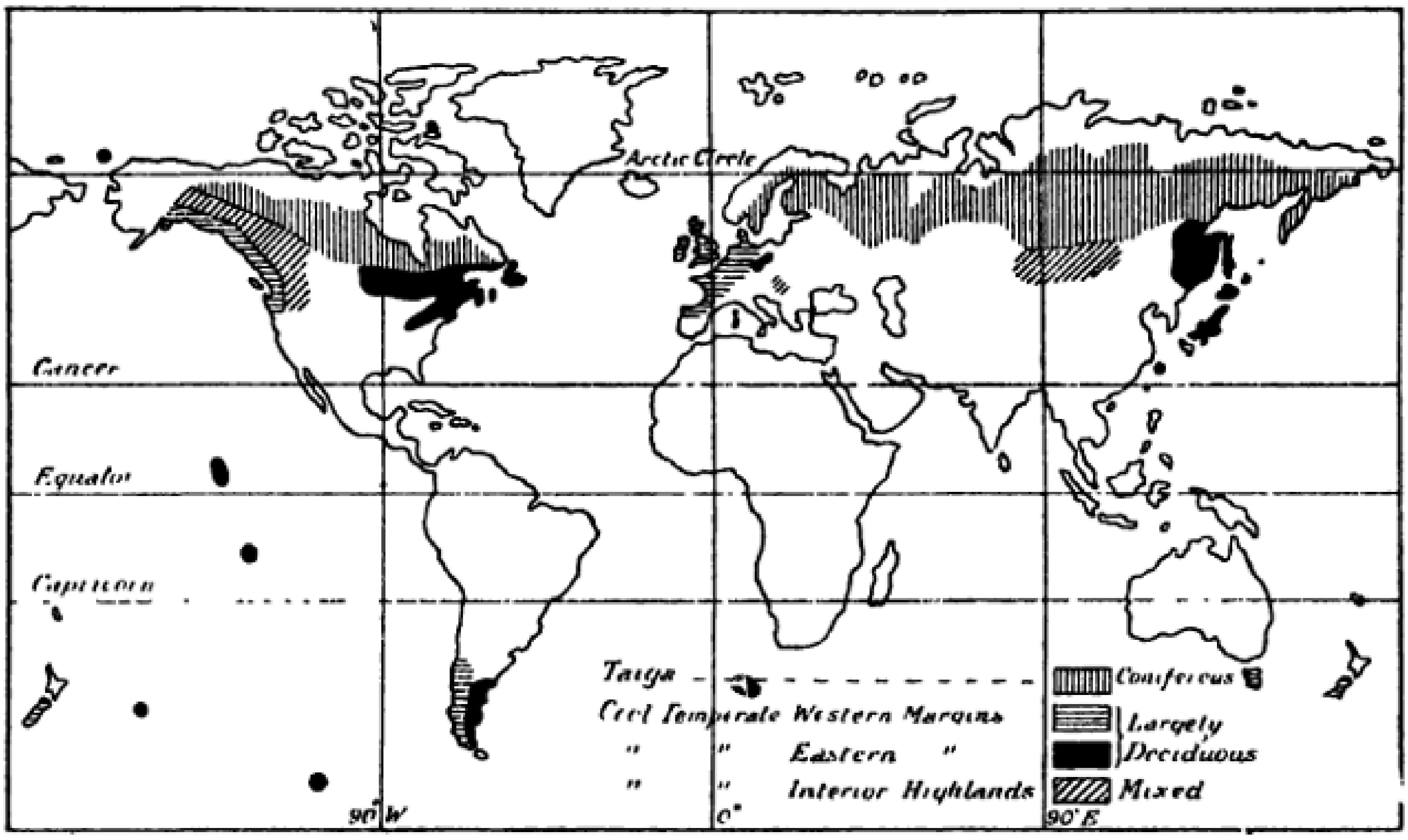


FIG. 84: DISTRIBUTION OF TEMPERATE FORESTS.

Eastern Marginal Type

The most typical of the so-called Eastern Marginal climatic regions are eastern Canada and north-eastern U.S.A.—a fact which accounts for the description *St. Lawrence type* applied to these regions. Other lands so classified are northern Manchuria and Patagonia (Southern Argentina). There is no representation of this type either in Africa or Australasia (Fig. 84), and though Japan might be included, the climate of the Japanese islands is considerably modified by oceanic and monsoon influences.

As the areas of the St. Lawrence type are situated on the side of the continents opposite to the cool *western* marginal lands, we should expect to find between them a marked difference in climate, as is actually the case. The cool *eastern* marginal lands experience a more extreme climate, the winters being much colder and the summers somewhat warmer than those of the western margins. Further, although the rainfall (which is caused by cyclonic disturbances) is evenly distributed throughout the year, it is by no means so abundant.

The difference in climate is due chiefly to the fact that the prevailing winds are off-shore, but a contributory cause is the presence of cold currents—the Labrador current off the north-eastern coast of North America, the Cape Horn current off Patagonia, and the Kurile current, or Oya Siwo, off the north-eastern coast of Asia (see Figs. 54 and 56)—which prevent any sea winds from picking up and carrying much moisture. The climate of these lands is therefore in a class between the cool western marginal lands and the cool interior lowlands, *i.e.*, it is not so equable as the oceanic climate nor so extreme as the continental climate. The cold of winter is, however, sufficient in some cases to freeze up the harbours. These regions, also, have been termed *Regions of Effort*.

Halifax (Nova Scotia), situated about 100 feet above sea-level, has a mean January temperature of 23°F., a July temperature of 64°F., and an average yearly rainfall of 56 inches. *Vladivostok* (in the extreme south-east corner of Siberia), at 55 feet above sea-level, has a January temperature frequently a few degrees below zero, and a mean annual July temperature of 68°F., with a rainfall of only 15 inches per annum. It approximates very closely to the true continental type, as it is not subject to any warm influences from stretches of water. *New York* (U.S.A.), on the other hand, situated at sea-level on an island off the east coast of North America, has a mean temperature in January of 30°F., and in July of 75°F., with a mean annual rainfall of 42 inches. *Tokyo* (Japan), also on an island, is similarly placed, although both the temperatures and the rainfall are higher—January 37°F., August 78°F., rainfall 58 inches per year.

The agricultural and pastoral occupations of eastern marginal regions are similar to those of western marginal lands, but the severity of the winter climate makes it necessary to house animals during that season, and involves the partial cessation of water transport owing to the freezing of rivers and lakes and the closing of ports by ice. In all of these regions there are valuable fisheries and forests. The forests are largely deciduous, but owing to the cold winters, conifers are present in greater numbers than in the cool western marginal regions.

With the exception of the area in North America (which in its industrial aspect resembles N.W. Europe) and the main island of Japan, the lands of this region are not greatly developed, although Manchuria is now being exploited. In Patagonia the climate is drier owing to the interception of the rain-bearing Westerly winds by the Andes to the west, and the narrowness of the continent tempers the extremes of climate. It is really a temperate desert region with a vegetation of scrub and poor grass. In Manchuria, the summer rainfall is increased by monsoonal influences.

Interior Lowland Type

To this type belong two great areas (Fig. 85)—that portion of the great central lowlands of North America which lies mainly within Canada, and the great stretch of level land, broken only by the Ural mountains, which stretches across Eurasia from the river Oder and the Baltic Sea to the river Yenisei. There is, in addition, the smaller area comprising the lowlands of Manchuria and Mongolia. Economically, the North American region is at present the most important.

[By courtesy of Canadian National Railways

A STRETCH OF FARMING COUNTRY, LAKE ST. JOHN, QUEBEC.
Canada's farmlands stretch for miles across the level plains, but the farm buildings cluster along the highway.

All these areas are situated in the centre of large land masses, and, on account of their latitude and their distance from the ocean, they experience great extremes of temperature and a low rainfall. The winters are long and severe, and the summers hot. The rainfall, which occurs chiefly in summer (because the winds are attracted farther inland by the low pressure), is sufficient for tree growth in the cooler areas only, where evaporation is less rapid. All lands in this class, which also are *Regions of Effort*, are sometimes referred to as "central plains" or "continental interiors". Their climate is described as being of the *continental* or *temperate grassland* type, and typical examples are the *Prairies* of North America and the *Steppes* of Soviet Russia. There are no areas in the Southern Hemisphere strictly within this group, because in this hemisphere there are no land masses in the latitudes concerned sufficiently extensive to permit of the existence of such regions.

Winnipeg **(Canada), about 1,000 feet above sea-level, has a mean January temperature of —3.5°F. and a July temperature of 66°F., with an average yearly rainfall of 21 inches.** ***Odessa*** **(Ukraine), 200 feet above sea-level, has mean average temperatures of 25°F. for January and 73°F. for July, and a mean annual rainfall of 16 inches. The temperature differences are due largely to the lower latitude and altitude of Odessa as compared with Winnipeg.** ***Barnaul*** **(W. Siberia), nearly 500 feet above sea-level. bears a**

close resemblance to Winnipeg except with regard to rainfall: its mean temperatures are —2°F., January, and 67°F., July, while its mean rainfall is 11 inches. Nowhere in these regions does the average rainfall exceed 35 inches per annum. It usually lies between 10 inches and 30 inches.

The great areas of the cool interior lowlands consist of rolling, grassy plains almost entirely devoid of trees. Climate has a great effect on the vegetation. In spring the grass is green, but in the hot summer it becomes scorched and turns brown, whilst the severe winters bring snow in many places and cause the rivers to become frozen over. In the past, these lands have been devoted solely to the rearing of grass-eating animals such as the horse, sheep and cattle, as is evidenced by the ranching activities of the cowboy of North America and the Cossack of Russia. More recently, the most fertile areas have been given over to the production of temperate cereals, such as wheat, oats and barley. The prairies of North America and the Russian steppes, for example, are the world's leading producers of these cereals; indeed, they have been well described as the world's great granaries. Cattle and horses are still reared in large numbers, but on the whole the winters are too severe for large-scale sheep-rearing.

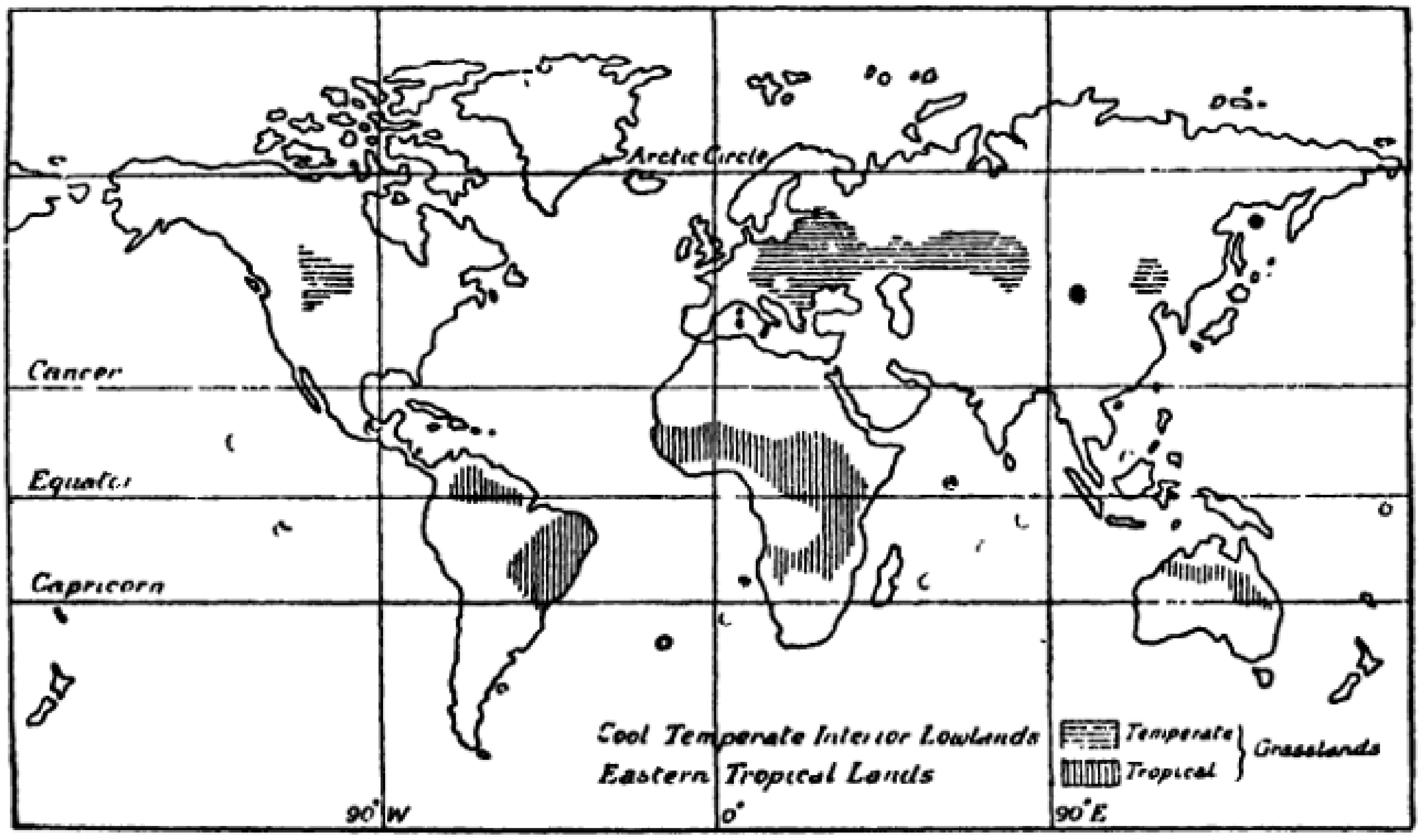


FIG. 85: DISTRIBUTION OF TEMPERATE AND TROPICAL GRASSLANDS.

The women of the nomadic tribes of south-central Asia make wonderful rugs and carpets which are of sufficient value to be transported by the expensive method of camel transport to the coast or railway.

In areas like these great rolling plains, where the centres of production are at great distances from the chief markets, the problem of railway construction assumes great importance. In Central Eurasia the building of railways would probably do as much to open up that region as the Canadian railways have done for the Canadian prairies and backwoods. In Mongolia and Manchuria, too, development has been slow, but the agricultural industry, with Chinese labour, is steadily developing.

Interior Highland Type

All the high mountains in the cool temperate zone are natural regions of the interior highland type, but the two most important areas are the Rocky Mountains on the western side of the interior lowlands in North America, and the Altai Mountains on the eastern side of the interior lowlands in Eurasia (Fig. 84). Throughout the highlands the effect of altitude is evidenced by the snow-clad peaks and the tundra-like character of the vegetation immediately below the snowline, followed by coniferous forests, deciduous forests and grassland at successively lower levels. Pastoral occupations are important on the lower slopes of all these highlands, the higher pastures being utilised in summer and the lower in winter, and, where the valleys are both warm and fertile, agriculture is successfully practised.

As the North American highlands are on the western side of the continent, the rainfall decreases from west to east, and the western slopes, which receive more rainfall than the eastern slopes, have much more forest land. Considerable economic activity exists in this area, differences in altitude and degree of slope and shelter causing local variations. Lumbering is important, while mining, agricultural and pastoral industries also are actively pursued, but the possibilities of the region are not nearly exhausted.

The Altai region does not benefit from nearness to the sea, as does the North American region, so that its climate is more extreme and its rainfall less. Moreover, in this region the rainfall diminishes, not from west to east, but from north to south, and, as we should expect, the northern slopes possess the greater forest areas. Apart from hunting and a little mining, the district is comparatively undeveloped.

Kamloops, referred to on p. 8, could justifiably be included in the interior highland type of cool temperate region. The smaller areas of this type include the Alps, the Pyrenees, the Carpathians and the highlands of Scandinavia, while we might almost include the highlands of Wales, Scotland, Japan and New Zealand.

All these highland areas show great variations of climate and vegetation according to altitude, degree of slope, extent of shelter, latitude and nearness to the sea, but they may as a whole be described as *Regions of Difficulty*. The amount of energy which has to be exerted is so large for the reward obtained that the neighbouring regions where life is easier offer a strong inducement to migration. Hence, with the possible exception of North America, these areas are regions of emigration, and support only a small permanent population.

WARM TEMPERATE REGIONS

Western Marginal Type

Regions in this group are usually spoken of as being of the *Mediterranean Type* because the most characteristic examples are the lands bordering the Mediterranean Sea. In addition to these lands, however, the group includes central California, central Chile, the extreme south-west of Africa, the south-west of Western Australia, the south-east of South Australia, and, in a modified form, the North Island of New Zealand (Fig. 86). All these areas have two common characteristics: their position on the western margin of the land masses and their climate.

We have already seen that the apparent movement of the sun north in the northern summer and south in the southern summer is accompanied by a movement of the pressure belts and therefore of the winds. This factor is of supreme importance in producing the Mediterranean type of climate, for the situation of the so-called "Mediterranean" lands (*i.e.*, regions with the Mediterranean type of climate) is such that, as a result of the swing of the pressure belts, they are subject to the dry Trade winds in summer and to the wet Westerlies in winter. In the summer, these lands are in the Tropical high pressure belts from which the winds blow outwards, but, in winter, low pressure conditions prevail and winds blow in from the ocean. The climate of these lands is thus one of summer drought with hot weather and cloudless skies, and winter rain with warm weather; in brief, hot, dry summers and warm, wet winters. For this reason "Mediterranean" lands are sometimes referred to as "winter rain" regions.

Cape Town (South Africa), 40 feet above sea-level, has a typical Mediterranean climate. The mean temperature in January is 70°F., and in July 55°F., a range of only 15°. The mean annual rainfall is about 25 inches, of which over 17 inches falls in the winter months from May to September. *Rome* (Italy), on the other hand, 160 feet above sea-level, has mean temperatures of 44°F. for January and 77°F. for July, a range of 33°F., with a rainfall of 32 inches per annum, of which only 3 inches fall in June, July, and August. The greater range of temperature at Rome is accounted for by the fact that it is further from the Equator than Cape Town and so has a lower winter temperature. *Madrid* (Spain) has a range similar to that of Rome, but as this city is over 2,000 feet above sea-level, the temperature is somewhat lower at all seasons: 40°F. in January and 76°F. in July. *San Francisco*, on the foggy coast of California, has a temperature range of less than 10°F., the figures being 50°F. for January and 59°F. for July. *Perth* (Western Australia), is typically Mediterranean and is slightly warmer in summer than Cape Town. It has temperatures of 74°F. in January and 55°F. in July.

In general, the rainfall of the "Mediterranean" lands varies according to local conditions, and, except where great elevation or local rain-bearing winds increase it, the precipitation is relatively scanty. Irrigation is thus frequently necessary for the cultivation of crops. In this region, it is lack of moisture and not lack of heat that causes the cessation of plant growth, and this cessation takes place in summer—the growing season in higher latitudes. Consequently, if water can be artificially

The rainfall of these regions is too scanty for timber growth, so that the natural vegetation is of the grassland type, although in Australia the grassland is interspersed with scattered eucalypts in the form of trees or bushes. The quality of the grass varies greatly with the amount of rainfall; the damper parts are clothed with wet grass, whilst the drier parts are covered with poor grass or thorny scrub. The drier areas are therefore steppe lands given over to stock-raising and other pastoral occupations, whereas in the better watered parts cereals such as maize, wheat and barley are grown in large quantities. The cultivation of cereals, however, is possible in many places only with the aid of irrigation, though they are grown even in the driest parts where water can be artificially supplied from wells or mountains.

Interior Highland Type

The lands of this type bear a resemblance to the Turan type, for considerable areas are desert or semi-desert. They may therefore be classed with the Turan type as *temperate deserts*. Included in this group are the great plateaus of the world—the Iran plateau, Asia Minor, parts of Arabia, Bechuanaland and the north of Cape Colony in Africa, the western parts of the Mississippi-Missouri Basin in North America, the higher Mexican plateau and those portions of the plateau of Central and Western Australia which lie south of the Tropic of Capricorn (Fig. 83). These regions are referred to as being of the *Iran Type*, and, with the Turan type, are called *Regions of Difficulty* or *Regions of Lasting Difficulty*. Their rainfall is low, their climate extreme and considerable areas are only slightly productive. Physical conditions, as usual, cause variations, the African region enjoying a less extreme climate than the other areas because it is not surrounded by high mountains.

Johannesburg (South Africa), over 6,000 feet above sea-level, has a mean January temperature of 68°F. and a mean July temperature of 47°F., with a mean annual rainfall of 30 inches, whilst the respective figures for *Salt Lake City* (U.S.A.), 4,360 feet above sea-level, are 29°F., 75°F. and 16 inches. *Bloemfontein* (South Africa), nearly 2,000 feet lower than Johannesburg, and at nearly the same height above sea-level as Salt Lake City, has mean temperatures of 70°F. for January and 46°F. for July, the rainfall averaging 22 inches per annum. Similar differences are seen between *Kimberley* (South Africa) and *Kashgar* (Sin Kiang). The former, 4,000 feet above sea-level, has a January mean temperature of 75°F. and a July mean temperature of 48°F. The figures for Kashgar, at a similar height, are 22°F. and 80°F. The difference in the mean annual rainfall is nearly 15 inches, the figures being 18 inches for Kimberley and a little over 3 inches for Kashgar.

As is to be expected, the natural vegetation of the Iran group is grassland or scrub, according to the amount of rainfall. The African areas have the more abundant grass as they receive a heavier rainfall, but even here there are large tracts of poor grassland and scrub, particularly in the area near the Kalahari desert. Irrigation is largely employed (for example, at Salt Lake City), and on the African plateau water from wells is utilised and rivers have been dammed.

The chief occupation of the wandering pastoral tribes who make their homes on the poorer grassland is the rearing of cattle, horses and sheep. This is especially important on the South African Veld, but in those areas where irrigation is possible, as in the eastern part of the African area and around Salt Lake City and Mexico City, the land is well cultivated to yield cereals, cotton, tobacco and fruits (figs, apricots, peaches).

TROPICAL REGIONS

Hot Deserts

The hot deserts of the world constitute the western marginal type of the tropical regions. They are found in the zone subject to Trade winds on the western sides of the great land masses, and include the Atacama region of South America, the Colorado region of North America, the Sahara, tropical Arabia, the Thar Desert of India, the Kalahari in South Africa and the western part of the interior of Australia (Fig. 83).

The climatic characteristics of these regions are an entire absence or great scarcity of rainfall, with a great range of temperature both between day and night and, in inland localities, between summer and winter. The cold ocean currents washing the western shores of the Sahara, Peru, Lower California, South-West Africa and Western Australia (see Figs. 54, 55 and 56) increase the aridity of these regions by their effect in cooling and drying any winds which blow onshore from the sea. In some cases, too, mountain barriers accentuate aridity by robbing the winds of what little moisture they hold. Sometimes, as, for example, in Mexico, altitude lessens the extremes of heat and cold.

The tropical deserts vary in size according to the size and shape of the land masses. There is a great expanse of desert country stretching from the Atlantic Coast in North Africa westward to the Thar desert of India. Included in this area, and occupying the whole of Northern Africa, with the exception of a narrow coastal strip in the extreme north, is the vast Sahara Desert, which gives its name to the hot deserts as a group, *i.e.*, they are often referred to as being of the *Sahara type*, and are all *Regions of Privation* or *Regions of Lasting Difficulty*.

The absence of hot deserts on the *eastern* margins of the continents is accounted for by the fact that the Trade winds in the latitudes of the hot deserts blow from the east over the sea and are therefore moisture-laden.

Iquique, on the coast of Chile, 30 feet above sea-level, has mean temperatures of 71°F. in January and 61°F. in July, the small annual range being due to sea influences. The mean annual rainfall is here almost negligible, for the region is in the rain-shadow of the Andes. Sea influences also make the range of temperature small at *Walfish Bay* (S.W. Africa). Here, 10 feet above sea-level, the range of temperature is only about 7°F., the figures being 66°F. in January and 59°F. in July. The mean annual rainfall is 0·3 inches. *Aswan* (Egypt), 360 feet above sea-level, and situated inland, has great extremes of temperatures, the mean temperature being 60°F. in January and 93°F. in July, with no actual recorded rainfall. *Alice Springs* (Central Australia) has a similar range of temperature, but, as it is situated 2,000 feet above sea-level, the figures are a little lower—87°F. in January and 52°F. in July. The mean annual rainfall is 10 inches. *Onslow*, on the coast of Western Australia at sea-level, and in almost the same latitude as Alice Springs, has a smaller range of temperature: 84°F. in January and 64°F. in July, while its mean annual rainfall is 7 inches.

The surface of the hot deserts is largely covered with sand dunes and there is a general, but not a total, lack of vegetation, that which does exist being specially adapted to resist great heat and drought. Where underground water wells up to the surface *oases* occur, and where this happens, or where a river flows from distant snow-clad or rainy mountains and brings life to a narrow belt of country, as in the valley of the Nile, the natural fertility of the soil is marked. In such regions palm trees flourish, and the inhabitants grow cereals (such as maize, wheat and barley), peas, beans, cotton and tropical or sub-tropical fruits (such as the date, fig, orange, lemon, pomegranate, melon and olive).

The great expanse of the *Sahara* is broken only on the east by the long narrow oasis of the Nile which runs from south to north. Elsewhere there are a few channels or *wadis* which occasionally are partly filled with water. In other parts there are wadis which are always dry although water is usually present beneath them. These channels furnish evidence that at one time the Sahara was better watered than it is now. East of the Nile is the *Nubian* desert and west of it the *Libyan* desert. The Sahara passes into poor steppeland to the north and south. Running from north-west to south-east is a range of mountains, including the Tibesti Highlands and the War Mountains.

Some parts of this great desert consist of barren rock, and others again of stony waste, but the greater part is a succession of sand dunes, shaped by the action of the wind, and sometimes reaching a height of 500 feet. The sand is powdered rock, formed by the action of the wind and as a result of variations in temperature. In order to withstand the drought, the plants are small-leaved and in some cases are leafless. They exude gum to prevent evaporation, and the roots are so formed as to hold water and to reach far down to the water beneath the surface. Spikes and prickles also are developed to protect the plants from mutilation by animals.

The most familiar of the desert animals is the camel, which, in common with all desert animals, has a wide foot to prevent its sinking into the sand, can go without food or water for a very long time, and is coloured so that it is not easily distinguishable from the sand.

The Sahara is dotted with oases, where human activity is naturally limited according to the quantity of water available, and where the characteristic vegetation is the date palm. The existence of these oases is in itself a proof that, were it not for lack of water, much of the desert would be cultivated, as the land is naturally fertile. In the south of Algeria, for example, where the French have made the land productive by boring artesian wells, and in the Nile valley, a variety of crops is grown. The Sahara has from time immemorial been a natural barrier between the white races of Europe and the black races of Africa.

The *Kalahari* desert is not to be compared with the Sahara in aridity. Here, vegetation varies considerably from place to place and from season to season. The greater part is relieved from barrenness only by small growths of bush-shrub and the thorny succulent plants characteristic of arid regions, but in the south and east there are large tracts covered with good grass, while some parts are even wooded. The region is one of inland drainage which is, however, indefinite and the streams are intermittent. In the north there are numerous salt pans and salt marshes and several marshy lakes, the chief of which, Lake Ngami, is the centre of drainage. The desert is continued west in South-West Africa by the Damara-Nama Plateau and a sandy coastal plain. Considerable supplies of underground water are said to exist in the semi-arid regions, and in South-West Africa water can be reached by boring. If the utilisation of this subterranean water supply can be developed, as no doubt it can be, much of the Kalahari desert will become productive.

In the valleys of the *Arabian* desert, cultivation is practised under irrigation. Elsewhere this desert is almost entirely devoid of vegetation, and the same is true of the *Thar* desert. *Central Australia* has a railway running across its southern border, and the north and south are also being connected by rail. There are small areas of grass and thorny acacias in this desert, but the greater part is lacking in vegetation. In the Coolgardie and other districts, however, the presence of gold led to the growth of large settlements, to which water is conveyed by means of pipe lines. The *Colorado* desert of North America, which is robbed of rain by the Rocky Mountains, is remarkable in some places for a system of "dry farming", while in other places crops are raised by means of irrigation. For the most part, this desert is composed of alkaline plains with scattered clumps of succulent plants. In South America, the *Atacama* desert, robbed of its moisture by the Andes, is the world's greatest source of nitrates, and its only available water supply is obtained by means of boring near the coast.

Eastern Tropical Lands

The eastern tropical lands lie between the Tropics of Cancer and Capricorn, immediately to the north and south of the equatorial lands. The most typical area of this type is the Sudan in Africa, and consequently lands in this group are sometimes collectively known as the *Sudan type.* Other areas are the East African Plateau, the area immediately north and south of the Amazon equatorial area, and a belt just south of the northern peninsulas of Australia (Fig. 85).

The Sudan type is a typical transition area between the equatorial lowlands and the hot deserts. It is impossible to give a definite line of demarcation between these two, for the equatorial lowlands, with their constant rains, gradually merge into the eastern tropical lands, which experience a heavy summer rainfall, and these lands in turn gradually merge into the hot deserts, where the rainfall is practically negligible. It will therefore be seen that, as we recede from the Equator, the total yearly rainfall becomes less and the season of rainfall becomes more definitely marked. The range of temperature in the Sudan lands, although greater than that of the equatorial regions, is, especially in wetter places, less than 10°F., whilst in the drier parts the range is greater although not, on the whole, so great as in the hot deserts. The heavier summer rainfall is due to the migration of the sun north and south, which makes these regions areas of low pressure in summer and thus subject to inflowing winds. Lands of the Sudan type, therefore, experience hot, wet summers, and very warm, dry winters. In this respect, and in their situation between the tropics, they resemble the monsoon lands, but it will be apparent later that the two types are distinct on account of wind conditions and amount of rainfall.

Kuka (Nigeria), 850 feet above sea-level, has a mean temperature range of 21°F. and a mean annual rainfall of 20 inches. As the rain falls mainly in the summer months, there is a marked fall in temperature from April to August and a rise from August to October. Thus, the January temperature averages 71°F., April 92°F., July 83°F., August 79°F., and October 85°F. This is a typical example of the way in which precipitation lowers temperature.

Khartoum, the capital of the Anglo-Egyptian Sudan, situated 1,250 feet above sea-level, has mean temperatures of 70°F. in January and 92°F. in July, but as it is situated in the north of the eastern tropical area, almost on the margin of the hot desert area, the rainfall is less than 10 inches per annum and the greater part falls in July and August. This illustrates the principle that as we recede from the equatorial lands through the Sudan type to the hot desert areas, the rainfall becomes less, and more markedly seasonal.

Tabora (Tanganyika), situated only 5° south of the Equator, at a height of 4,000 feet above sea-level, has a range of only 2°F. between the mean January and July temperatures, *i.e.*, 70°F. in July and 72°F. in January. The temperature is low for the latitude, because of the height above sea-level. The rainfall averages 30 inches per annum and is less markedly seasonal than that of Khartoum because of its situation on the equatorial margin.

Bulawayo (Rhodesia) affords another example of the modifying effect of altitude on temperature. Situated 4,500 feet above sea-level, the mean temperatures are 71°F. in January and 57°F. in July, and the average annual rainfall is 24 inches. The greater range of temperature and the smaller yearly rainfall as compared with Tabora are due to the higher latitude of Bulawayo.

Rio de Janeiro (Brazil), 200 feet above sea-level, is on the margin of the monsoon region. It has a heavy rainfall (44 inches per annum), but the driest months are not so dry as those of the typical monsoon lands. As it is situated on the coast, the mean annual range of temperature is not so great as that of, for example, Bulawayo, the January mean temperature being 78°F. and the July mean temperature 67°F.

Daly Waters (North Australia) may be taken as affording a further example of the similarity between the Sudan type and the monsoon type of region. Although it is situated less than 5° south of Darwin, which is in the monsoon area, and although the difference in the mean temperatures of the two places is only about 3°F., there is a marked contrast in the mean annual rainfall figures: Daly Waters averages 28 inches a year, whilst Darwin averages 62 inches a year—a difference of 34 inches.

It has already been stated that the almost total lack of rainfall in the hot deserts causes an almost total lack of vegetation. As the desert gradually merges into the areas of summer rain, vegetation becomes more abundant, until towards the equatorial areas it is prolific. On the whole, however, the lands of the Sudan type have not a sufficient annual rainfall to support forest growth, and the typical vegetation is therefore grass. Those areas which merge on the equatorial lands, and which have a heavier rainfall, have forest districts which gradually merge into the equatorial forest areas.

The "summer rain" areas are commonly known as the *Tropical Grasslands* or *Savannahs* (*savannas*, or *savanas*), *e.g.*, the savannahs of the Sudan. In other countries they receive special local names, such as the *llanos* of Venezuela and the *campos* of Brazil.

parts. The great danger to crop cultivation, however, is the failure of the rains, which occasionally occurs in some areas. Irrigation is therefore employed, especially in the Anglo-Egyptian Sudan, where thousands of acres of land produce cotton under irrigation. This area is, in fact, the most highly developed agriculturally of all the savannah lands. The forested and tall-grass areas of the Sudan type are the home of the lion and other large wild animals, but domesticated cattle have had to be bred from imported strains.

Near the desert margins human life becomes nomadic and difficult, but on the whole the Sudan type is a *Region of Effort*, where man can obtain a fair reward for his labour if he is willing to make the best of such natural resources as are available, as, for example, by practising irrigation.

Monsoon Lands

The monsoon lands and the savannah lands have already been compared. Briefly, both types lie mainly within the Tropics, while both have summer rain, hot summers and warm winters. The monsoon lands, however, are warmer in winter and wetter in summer than the savannah lands. Typical monsoonal conditions are found in India, Indo-China and Southern China, but monsoonal effects also occur on the fringes of other large land masses, *i.e.*, in northern South America, the West Indies, Central America, Madagascar, the East African coastal margin opposite Madagascar, the north-west of Australia, and those islands of the East Indies which are situated near the margins of the land masses (Fig. 86). Japan and the remainder of China also are subject to monsoon winds, but they cannot be classified with the monsoon countries named above, as they are situated too far north and their winters are too cold.

The term "monsoon" is derived from an Arabic word meaning "season", and in India the phrase "the coming of the monsoon" refers to the rains brought by the monsoon winds. Strictly speaking, the N.E. Monsoon of the Northern Hemisphere and the S.E. Monsoon of the Southern Hemisphere are merely the normal Trade winds, and it is only to the S.W. Monsoon of the Northern Hemisphere and to the N.W. Monsoon of the Southern Hemisphere that the term "monsoon" should accurately be applied. It is, however, customary to use the term as we have used it in this book.

A typical *monsoon climate* is one characterised by a very hot, dry spring and early summer, a hot, wet late summer and early autumn, and a warm, or cool, dry late autumn and winter. There are thus only three seasons, in contrast to the four of other regions. In the Northern Hemisphere the seasons are, roughly, from February to mid-June, from mid-June to October, and from November to January respectively. In the Southern Hemisphere the seasons are, of course, reversed. The great variations in relief of the monsoon lands, however, cause local [illegible] particularly in rainfall. An annual rainfall of over [illegible] but this is exceptional, being due to the unusual exposure of the district concerned to the full force of the wet monsoon. In other places the annual rainfall is less than 20 inches, for example, in parts of the Indus basin. As in the savannah lands, the great rainfall in the wet season causes the temperature to be lower than it would be otherwise.

Bombay (India), situated almost at sea-level, provides an example of the effect of rainfall on temperature. The January mean temperature is 74°F. and the mean rainfall practically nil. In May the figures are 85°F. and 5 inches; in June 82°F. and 20·5 inches; in July, August, and September 79°F., and 24·5, 15 and 11 inches respectively; in October 81°F. and 2 inches; and in November 79°F. and ·5 inches. The mean annual rainfall is about 74 inches and the comparatively low range of temperature is due to situation near the sea.

At *Lahore* (N.W. India), 700 feet above sea-level, temperature and rainfall are greatly affected by situation inland. Thus the mean temperatures for January and July are 53°F. and 89°F. respectively, the hottest month being June, at 93°F. The range is thus nearly 40°F., and a graph of the monthly temperatures would not show a curve between the two dry periods, but a steady fall from June to January. The mean annual rainfall is much lower, at 20 inches, than that of Bombay, the wettest months being July and August with 7 inches and 5 inches of rain respectively. The greater rainfall of Bombay is due largely to relief, for the winds are forced to deposit much of their moisture on meeting the Western Ghats, and by the time they reach inland places such as Lahore they are comparatively dry.

Mozambique (Portuguese East Africa), situated at sea-level, naturally has a small range of temperature: 83°F. in January and 74°F. in July. The mean annual rainfall is 46 inches.

Darwin (North Australia), almost at sea-level and on the coast, is similarly situated. The mean January temperature is 83°F. and the mean July temperature 76°F., with a mean annual rainfall of 62 inches. The hottest month is November (86°F.), and during the wettest months, December, January, and February, there is a temporary lowering of the temperature similar to that which occurs during the wetter months at Bombay.

The vegetation of the monsoon lands is determined by the distribution of rainfall. In the wetter parts the natural vegetation is forest—of the evergreen type in those regions where the rainfall is over 80 inches. As the rainfall diminishes, the vegetation passes into the typical monsoon forests of teak, sal and similar woods, then into woodlands, then into scrub, and later into semi-desert and desert.

Like the savannah forests, the monsoon forests are more easily cleared and are less unhealthy than the equatorial forests. Teak is an important export of Burma and to a less extent of India, but large areas of forest have been cleared in many of the monsoon lands and the chief occupation of the inhabitants is agriculture. Owing to the heat and the abundant seasonal rainfall, certain areas are extremely productive and support a teeming population. The conditions of human life and the type of crop cultivated vary with physical conditions and particularly with rainfall, but, on the whole, the monsoon lands are the most densely populated regions of the world, for large numbers can find sufficient for their needs within a small area. Nearly all the monsoon lands have been developed, and the cultivated crops show a greater variety than those of any other natural region. Rice is an important summer crop in the wetter regions, coffee and tea are grown on the hill slopes, and other summer crops are sago, cane-sugar, camphor, opium, cotton and indigo. The most important of the winter crops are millet and wheat in the drier parts, followed by pulses, oilseeds and tobacco. Jute is an important product of India. Camels, goats, cattle, sheep and elephants are typical in different localities.

So bountiful is the return from the soil in these regions that they are known as *Regions of Increment*, implying that little labour is necessary to reap a large reward.

In those areas which normally receive a heavy rainfall, a failure of the wet monsoon ruins the crops and causes famine. It is at such times that irrigation schemes probably assume their greatest economic importance. With the improvement in the means of communication, however, the failure of the rains is not quite so disastrous or the effects so far-reaching as was once the case, because food can now be rushed to the stricken areas in a comparatively short time.

Of the undeveloped monsoon lands, northern Australia offers the greatest possibilities, but until the policy of a "White Australia" is either abandoned or modified, it seems improbable that this area, with its great agricultural potentialities, will assume any great degree of economic importance. The cultivation of cotton, for example, is greatly hampered by the absence of all but expensive white labour, which makes the cost of production too high for successful competition in world markets.

Tropical Plateau Type

Tropical plateaus experience what is termed a *Tibet type* of climate. There are only two examples: the lofty plateau of Tibet in Asia and the Bolivian-Peruvian Plateau of South America (Fig. 87). Owing to their great height above sea-level these regions experience a climate which, strictly speaking, places them in the cool temperate groups, but for greater convenience it is usual to distinguish them as a separate type.

The greater part of the land in these plateaus is over two miles above sea-level, and the Tibetan Plateau contains some of the highest peaks in the world. Naturally, the great variations in altitude in each of the regions cause marked variations in climate. The highest parts are covered with perpetual snow and ice, whilst some of the lower areas in Bolivia and Peru are almost tropical in character.

The climate of Tibet is more extreme, in the habitable parts, than that of Bolivia and Peru, partly because of its latitude, and partly because of the great size of the land masses of which it forms a part. Tibet has long, severe winters, hot summers, and little rain, whilst

Bolivia and Peru have a cool, equable climate with little rain. In each case the rain falls chiefly in summer.

The difference between the two areas in point of climate can be appreciated by comparing Lhasa (Tibet) with La Paz (Bolivia), for both are situated about 12,000 feet above sea-level. *Lhasa* has a mean January temperature of 27°F., a mean July temperature of 65°F., and a mean annual rainfall of 15 inches. *La Paz* has its warmest month in November (53°F.) and its coldest month is June (44°F.), with a rainfall of 21 inches. The differences are due to situation, Lhasa being 29° north of the Equator and La Paz only 16° south of the Equator, whilst the larger land mass of Asia accentuates the differences between the winter and summer temperatures of Lhasa.

The physical differences which cause great variations in climate also cause variations in the natural vegetation. In both cases, the high peaks, and particularly those in the north-west of Tibet, are a type of cold desert devoid of vegetable and animal life. Lower down there are a few scattered dwarf plants, and in the more accessible higher parts there is sufficient grass to support small herds of yak, wild asses and sheep in Tibet, and cattle, llamas and sheep in Bolivia and Peru. Around Lhasa, barley and pulses are cultivated under irrigation, and here, as also in the sheltered plains and valleys of the south, such fruits as the peach and apricot are produced. The more sheltered parts of Bolivia and Peru are given over to the cultivation of cereals and fruits. Life is much easier on these lower parts, but elsewhere it is a struggle for existence and therefore these regions have been called *Regions of Lasting Difficulty*.

The lands of the Tibet type are rich in minerals, largely unexploited because of the difficulty of access, the lack of capital, and the backwardness of the inhabitants. Of the two regions, the South American is the more developed, and yields tin, copper and silver in considerable quantities.

Equatorial Lowlands

Regions of the equatorial type are naturally found near the Equator. They consist for the most part of lands within 5° north and south of the Equator and include the Amazon Basin, the Congo Basin, the lower Guinea lands of West Africa, the larger part of the East Indian Islands and Malaya, and the coastal margins of north-east South America, notably the Guianas (Fig. 87). As the Amazon basin is the most typical of the equatorial type, these regions are sometimes referred to as being of the *Amazon type*, and, on account of the prevalence of evergreen forests, as of the *Equatorial Forest type*.

All these areas experience an *equatorial type of climate*, that is, constant heat and moisture, and almost uniformly high temperature throughout the year. The uniform temperature is due to the fact that the sun at noon is always near the zenith, although slight variations naturally occur. In many cases there is a yearly range of only 1°F. The difference between day and night temperatures is, in fact, usually much greater than the yearly range. The equatorial regions do not, however, experience quite such high daily temperatures as are encountered in parts of the hot deserts or even in certain areas of the savannah type, for the almost daily heavy rainfalls tend to keep the temperature lower than it would otherwise be. It is this combination of heat and moisture and still air which makes the equatorial forest areas such unpleasant places in which to live.

The areas situated on or close to the Equator receive their moisture almost entirely from convectional rains. The heat of the day causes the moisture to evaporate, and as the hot damp air rises it is cooled, forms clouds and deposits its moisture as rain. This circulation occurs every day ; the mornings are bright and clear but in the afternoon the clouds gather, and later the rain falls in torrential downpours, frequently accompanied by heavy thunderstorms.

The lands situated farther away from the Equator receive most of their rain from the normal Trade winds, which meet here and so create the region of the *Doldrums*, or *Belt of Calms*. The meeting of these winds results in a constant upward movement of air which, being cooled and forced to deposit its moisture as it rises, results in heavy daily rainfall.

The equatorial lowlands have no dry season such as is experienced by the monsoon or savannah regions, and in this respect they resemble the European type of region and are directly opposed to the hot desert regions. There are, however, *relatively* wet and dry seasons, and towards the Equator there are two annual periods of maximum rainfall. These occur immediately after the sun has reached its zenith, and are due to the normal northward and southward migration of the pressure belts and winds as the sun swings north and south of the Equator. Owing to the heavy rainfall, the relative humidity of the equatorial regions is essentially high, averaging about 80 per cent. during the year, and in some areas, more especially in the thickly forested regions, the atmosphere is particularly oppressive.

Lagos, on the West African coast, only 25 feet above sea-level, has a temperature range of 6°F. as it is near the equatorial margin. The hottest month is March (82°F.) and the coolest months July and August (76°F.). The rainfall averages over 70 inches a year, the wettest month being June (19 inches) when the temperature falls 3°F. compared with May.

Manaos, 120 feet above sea-level, is in the heart of the Amazon forest and over 1,000 miles from the sea. It has a yearly temperature range of only 2°F. : 78°F. from January to May, 79°F. from June to August and 80°F. from September to December. The mean annual rainfall is 86 inches, the heaviest amounts falling in the months of lesser heat, that is, during the months of January-May.

It may at first seem surprising that Lagos, on the coast, should have a greater mean temperature range than Manaos, situated over 1,000 miles from the sea, but a little thought will make it clear. Lagos is twice as far from the Equator as Manaos, and is, in fact, on the margin of the equatorial lowland region. In addition, the forests around Lagos have been cleared and the atmosphere is thus not nearly so humid as that of

Manaos, where the humidity tends to make the mean monthly temperatures more even.

Equatorville (Belgian Congo), situated on the Equator 1,000 feet above sea-level, is, as regards temperature range, an even more typical example, for here the temperature rarely rises or falls appreciably above or below 76°F.

Para (Brazil) has a position on the coast similar to Lagos, but as it is 5° nearer the Equator (it is only 1°27″ S. of the Equator), the temperature range is smaller, being less than 3°F. The hottest month is November (80°F.) and the coolest February (77°F.). The mean annual rainfall is 87 inches, Para being subject both to convectional rains and to land and sea breezes, and nearly one-half of the annual rainfall occurs during the four coolest months of January-April.

Batavia (East Indies) is in a position similar to Lagos, being on the coast and also on the equatorial margin. As, however, it is an island, the range of temperature is less (2°F.) and the rainfall is slightly more evenly distributed.

The island of *Singapore* (Malaya) has a mean annual rainfall of 93 inches, much heavier than that of Batavia, partly as a result of its mountainous nature, and partly because of the land and sea breezes to which the island is subject. The mean January temperature is 78°F. and that of July is 82°F., but in spite of the high rainfall and temperature figures, Singapore has quite a healthy climate, the atmosphere being much less humid than that of other areas in the equatorial regions. Such mountainous island areas in the equatorial belt have, in fact, been placed in a separate group known as the *Equatorial Mountainous Island type*.

The *equatorial maritime climate* is exemplified in *Ocean Island*, where the daily temperature of 82°F. rarely varies throughout the year, and where the mean annual rainfall of 80 inches is spread over each month fairly evenly, the difference between the wettest and driest months being generally only 6 inches.

It must again be emphasised that, although the mean annual range of temperature in equatorial lands is on the whole very small, the

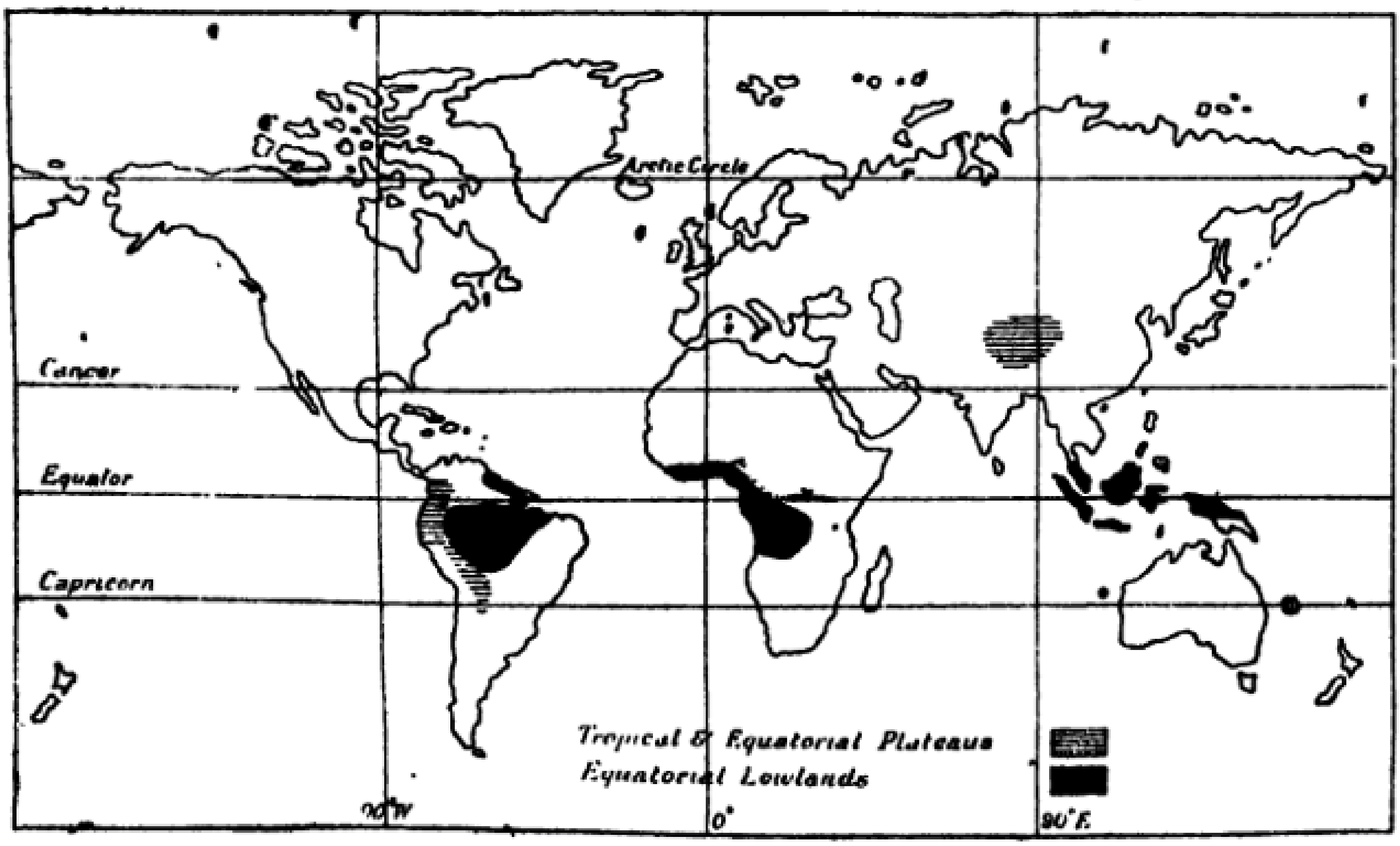


FIG. 87: DISTRIBUTION OF TROPICAL HIGHLANDS AND LOWLANDS.

difference between the day and night temperatures is frequently over 10°F., and in some cases as much as 20°F.

The constant heat, the abundant rainfall, and the absence of a winter to check growth, give the equatorial lands an abundance of luxuriant vegetation, and as a consequence much of the area is covered with dense equatorial forests or jungle. The great struggle here is not for moisture but for air and light. So dense is the foliage overhead that the lower levels are usually hot, damp and very unpleasant dark labyrinths of internetted trunks thickly clothed with undergrowth, through which it is difficult, and sometimes impossible, to travel. Where the sunshine pierces through a break in the leaf canopy, a profusion of vegetation springs up from the ground and rapidly grows to a great height. When this decays it leaves a mass of rank matter which it may be impossible to penetrate.

Above the crowns the forest is ablaze with highly-coloured flowers,—orchids, etc.—all rooted in crannies in the stems where dead vegetation has accumulated. Here are myriads of insects feeding on the pollen, and to devour these are birds such as the humming bird and bird of paradise, and even tree frogs.

Other trees bear nuts so that the canopy is alive with monkeys and the pincer-billed birds such as the parrot and the macaw. The life of these forests is really in the tree tops where everything is seeking a place in the sun.

The forests contain hardwoods and other valuable trees in great variety, including ebony, mahogany, dyewoods, logwood, greenheart and brazil-wood, but only in a few places have they been exploited extensively. On the fringes of the forests agricultural clearings are found in which are cultivated, near the coast, the oil-palm (Nigeria) and the coconut palm, and, further inland, such products as rubber (Malay, Amazon, Congo), coffee (Brazil), sago, bamboo (Malaya), cocoa (Gold Coast), plantains, bananas and spices.

Physical conditions and human control naturally cause variations, and whilst the Amazon basin is mainly clothed by the dense type of vegetation mentioned above, other areas show differences. Thus, the mountainous character of the East Indies gives a greater variety of forests; the porous sandstone of part of the Congo Basin gives rise to areas of tropical grassland; while grass is the typical vegetation of the plateau of central Borneo. The influence of man is seen in West Africa, Malaya and some of the East Indian islands. Malaya is the world's chief source of rubber, but the rubber tree, as stated on page 155, is not native to the region, having been imported from Brazil. By similar human agency the Gold Coast has been made the world's chief source of cocoa, and oil-palms have been planted over a wide area in the lower lands of Nigeria. Java is a typical example of the scientific development of equatorial lands by Europeans, and this island now has a population of over 800 to the square mile. For the most part, however, the equatorial forests are still unexplored, as they are extremely difficult to penetrate. This is especially true of the Amazon Basin and, to a smaller extent, of the Congo Basin. The former is likely to defy man's efforts for many years to come, but the latter is being proved to be reasonably capable of exploitation.

The equatorial lowlands have been termed *Regions of Debilitation.* There is no incentive to work, as nature is most bountiful, and there is no stimulus to exert effort for its own sake, as the climate is oppressive. The inhabitants have therefore become (or have probably always been) degenerate, stunted in growth, and mentally incapable of development, *e.g.*, the Pygmies of the Congo and the Indians of the Amazon. Even in the clearings, which can be made extremely productive, the natives are lazy and content with very primitive conditions. For example, it has been found necessary to introduce Hindoo, Tamil and Chinese coolie labour on the East Indian plantations, for these races are acclimatised to the more stimulating conditions on the fringes of the Tropics and are therefore more industrious. Diseases, too, at present impose a bar to colonisation by white men, who can spend only part of their lives in such regions. Finally, there is the unhappy factor of jealousy between the Great Powers, which has hitherto greatly hindered the complete development of equatorial areas under white supervision.

Equatorial Plateaus

Of this type, known as the *Ecuador type*, there is only one important example—the plateau lying partly in Ecuador and partly in Colombia

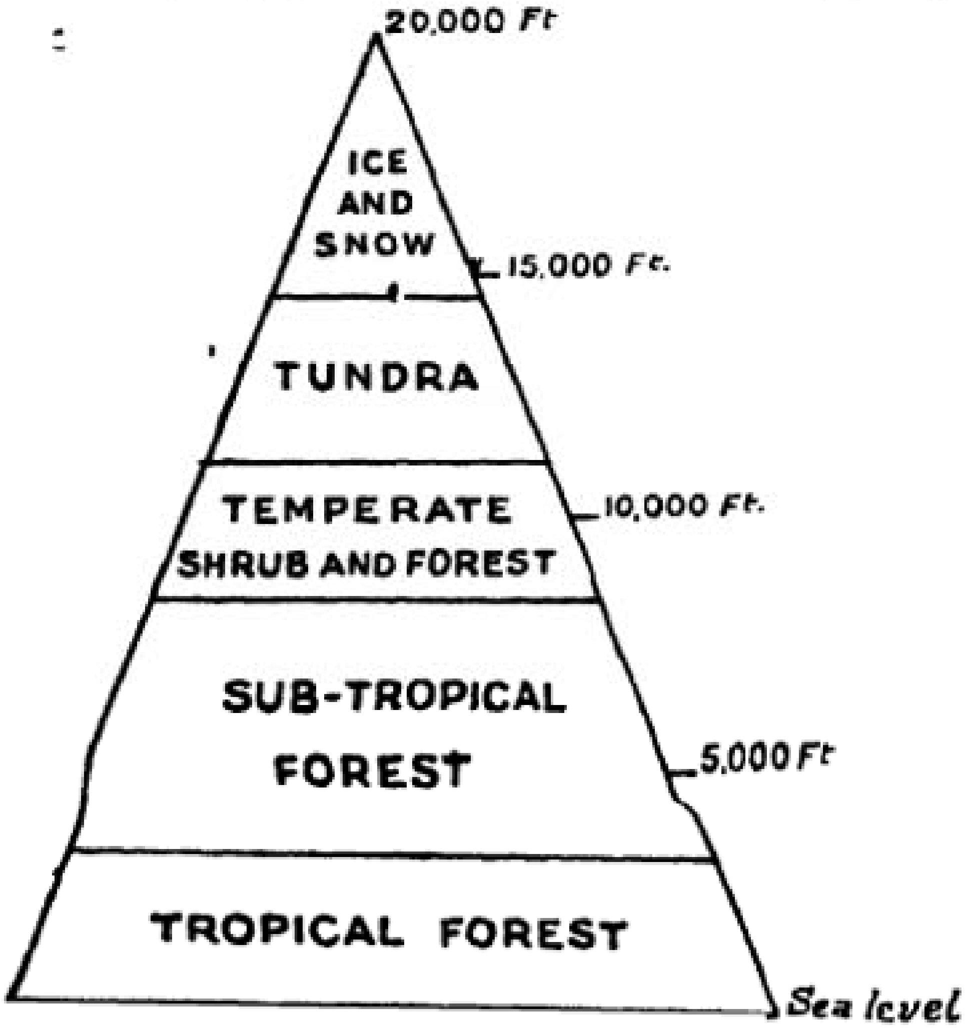


FIG. 88: SEQUENCE OF VEGETATION ON EQUATORIAL ANDES.

in South America, the habitable portion of which is between 8,000 and 10,000 feet above sea-level. In the inhabited area the temperature is equable all the year round, for the altitude of the sun changes very little and the mean temperature range is rarely more than 1°F. Owing to the great altitude, also, the temperature is much lower than in the equatorial lowlands, and the climate is like that of an English spring. There is frequently, however, a wide daily range in the temperature, the nights in some places being quite cold. Rain falls at all seasons and is abundant, there being a double maximum. At higher altitudes the climate is extreme, and the regions are uninhabited.

Quito (Ecuador), on the Equator 9,350 feet above sea-level, has mean temperatures of 54°F. in January and 55°F. in July, with a mean annual rainfall of 44 inches. Cold nights are, however, quite common, the daily range being due to altitude. *Bogota* (Colombia), 600 feet lower than Quito, has mean temperatures of 58°F. in January and 57°F. in July, with a rainfall of 63 inches.

There is a general, but not total absence of trees, and in the habitable parts temperate products such as wheat, barley, maize and vegetables are cultivated. Occasionally, however, cereals grown near the upper limit of cultivation fail to ripen. Grassland is found in some parts, and in such places the rearing of cattle, sheep and llamas assumes considerable importance.

QUESTIONS ON CHAPTER 9

1. What do you understand by the term "Natural Region"? Write notes on the following natural regions and state where they are found:—tundra, prairie, pampa, savanna. (*C.I.I. Prelim.*, 1931)
2. An elderly man, with an adequate income, wishes to settle down somewhere in a pleasant and healthy part of the world for the rest of his life. He consults you as to where he should go. Advise him, giving him some choice, and telling him of the advantages and drawbacks of the places you select. (*S.A.A. Prelim.*, *May*, 1931)
3. Describe the climate of the Mediterranean region, and show how that climate influences the principal products of the region. (*C.S.*, *June*, 1929)
4. Where are the *prairies*? Where else in the British Empire are similar regions? What are the chief products of these regions? (*L.C. of C.*, *Junr.*, 1929)
5. Name *two* extensive regions of equatorial forest. Give an account of the climatic conditions, name some of the products which are of commercial value, and state the uses to which they are put. (*C.S.*, *March*, 1931)

6. What is the chief product of—
   (*a*) the Canadian prairies ;
   (*b*) the Australian downns ;
   (*c*) the Argentine pampas ?

   State fully the advantages which each has for its particular product. (*C.S., March,* 1931)

7. State the position of any *two* of the chief hot deserts of the globe ; name their chief economic products and describe the occupations of their inhabitants. (*C.S., Dec.,* 1926)

8. Contrast an area having a monsoon climate with one having a Mediterranean climate from the standpoint of (i) rainfall, (ii) cultivated products. (*C.S., Dec.,* 1926)

9. If you were to fly from Ireland to Central Russia in winter what differences would you see between the two regions ? How can you account for these differences ? (*C.S., Nov.,* 1929)

10. Name two hot regions, one of which has a heavy rainfall and the other has little rain, and show how the climate affects the vegetation and the occupations of the people in these regions. (*C.S., May,* 1930)

11. Name two regions in Africa with sharply contrasted climates and show how the differences affect the natural vegetation and the life of man in the two areas. (*C.S., March,* 1928)

12. What is a desert and how does it differ from a steppe ? Illustrate by a brief account of one example of each, showing how the differences affect the life of man. (*C.S., Jan.,* 1930)

13. Name an area which has little rain at any season, one which has rain chiefly in winter, and one which has rain at all seasons. Offer an explanation of the rainfall conditions in each case, and indicate generally their effects on the life of man. (*C.S., April,* 1930)

14. Lands in the same latitude but situated respectively on the east and the west of a continent often exhibit marked differences in their climates. Illustrate this by reference to Africa south of the Equator. (*C.S., Jan.,* 1931)

15. Name *two* distinct types of forest, give a reasoned account of the world distribution of each, and discuss their economic importance. (*C.S., April,* 1930)

16. In what two distinct types of regions do we find rains normally occur at all times of the year ? Account for this. In the case of *one* of these regions indicate graphically the variations in the rainfall in the course of the year, and explain the variations that occur. *L.M., January,* 1930)

17. What regions of the British Empire are savannah lands ? Describe the typical climate of these regions, and the main occupations of the inhabitants. (*L.M., June,* 1929)

18. Account for two of the following :—
   (*a*) The distribution of deserts in the Old World from North China to the Sahara.
   (*b*) The seasonal distribution of rainfall in the middle part of the California Valley.
   (*c*) The seasonal distribution of rainfall in Japan.

   (*L.M., June,* 1930)

CHAPTER 10

THE LOCALISATION OF AGRICULTURAL INDUSTRIES. MAN'S CLOTHING

GENERAL FACTORS AND CAUSES

The Soil

In studying the pastoral and other agricultural activities of man, we are really investigating his relation to the soil. Although climate and other factors do much to determine the uses to which the soil shall be put, they cannot produce a yield of useful crops unless the necessary fertile medium is present.

Soil can be defined as a form of rock which has been so broken up as to be soft or loose enough for roots of some kind to penetrate it. There are no soils that do not contain some form of plant food, and, where absolute infertility exists, its causes are either purely physical, or, more rarely, chemical; as, for example, where the elements of fertility are present, but there is some poisonous substance in the soil which renders it sterile.

Sometimes it happens that, although a soil contains an abundance of plant food, yet it is relatively deficient in one or more of the substances which are essential to plant life. As a result, the soil will remain infertile unless it is artificially supplied with the missing essentials. If, for example, a soil is rich in everything but potash, the potash will be a limiting factor in the yield of the soil; for a plant cannot use any one food unless it has also a proportionate supply of the other foods.

Each kind of plant makes its own demands on the soil in which it grows, and, when the chemist analyses a plant, he finds that it contains certain characteristic proportions of those elements which the soil provides. The most important of these are potash, phosphoric acid and nitrogen. They are required in comparatively large quantities by crop plants, and are more likely to be insufficiently available than other substances which are just as necessary although they are not required to such a great extent. Crops which are grown for their ripe seeds require more phosphoric acid than those which are cut before the seed is formed as the principal demand in the earlier stages of a plant's growth is for nitrogen and potash. But if the earlier stages are stunted through a shortage of these two substances, then the plant's power of assimilating phosphoric acid for its seeds is proportionately limited, and it cannot benefit even by the presence about its roots of plenty of that substance. If in such conditions it is desired to increase the seed crop, the soil must be prepared by a judicious dose of potash before the crop is sown.

To put the matter in a formal way, we may suppose that a certain crop can use 8 lb. of potash to 1 lb. of phosphoric acid and that with these quantities it can increase its weight by about 1,500 lbs. If it can find only 7 lb. of potash to 1 lb. of phosphoric acid, it cannot utilise all the latter, and its increase will be very greatly reduced. The chemicals required do not act independently, but in balance with one another. Hence, too high a proportion of one substance will not make up for a deficiency in another, while a small addition of a deficient substance is capable of making a relatively enormous difference in yield.

It follows that the soils of large deltas and rich alluvial plains are the most fruitful of all; for they are derived from many different types of rock and contain an abundance of finely weathered minerals of many kinds. No element is lacking, and, though the constituents may not be present in ideal proportions, yet there is enough of each to afford the correct proportions up to the limit of the plant's powers of assimilation. In such cases the limit of growth is set, not by the least abundant mineral, but by the climate and the nature of the plant.

There is a common belief that the soil is a kind of reservoir of nutritive substances and that growing crops are like open taps, continually exhausting the reservoir so that, unless it is replenished with plant food, it will give ever-decreasing yields until it is finally emptied. This is not the case. The soil is a mixture of particles of rock, some comparatively large and some extremely small. All the particles are continually being weathered and worn, and every year a certain amount of solid substance is dissolved in the water brought by rain, rivers and irrigation. In this dissolved form, and in no other, can the growing plant utilise it. The consequence is that where virgin soil with large stores of accumulated plant food is cropped continually with the same kind of plant, there is a gradual falling off in yield after the first few years, but after a time a permanent level is reached at which no further falling off occurs. It is not suggested that this level is necessarily a profitable one, but the point is that the soil is never utterly exhausted. It gives up its plant food in annual doses, and very often a dressing of one substance only will have most profitable results by rendering other substances usable.

One of the most important constituents of soil is the substance called *humus*, which is the name applied to decayed vegetable matter in the form of a vegetable mould. The chemical action set up by this vegetable mould is such that, when it becomes more or less mixed with inorganic matter, it forms a most valuable soil. Inorganic material, as we have seen, gives up a very small part of itself annually; but, under the action of bacteria, decaying vegetable or organic matter breaks down much more quickly. Moreover, the process of decay takes place chiefly in the season of growth, when the broken-down material can be used immediately by the living plants. The weathering of *inorganic* matter, on the other hand, is often most rapid in winter when growth is dormant, and the result is that much of the valuable plant food so produced is washed out of the soil by rain as soon as it comes into solution.

Another property of humus is its power to absorb water and water solutions. It soaks up the plant food which is formed from the inorganic elements in the soil, and so prevents it from being wastefully washed away. Moreover, by retaining its moisture during dry weather, it acts as a reservoir of water and protects crops against climatic irregularities.

Maintaining the Fertility of the Soil

The chief ways in which the fertility of the soil can be maintained are by (i) tillage (including hoeing and dry farming), (ii) manuring, and (iii) the rotation of crops. Even in the most primitive agriculture at least one of these methods will be adopted.

TILLAGE includes all the manual and mechanical ways in which the soil is worked by tools. But it means much more than the preparation of a soft surface for the purpose of sowing or planting. Where frosts occur in winter, for example, autumn ploughing exposes the soil to their action, which is to break up the rock particles and to liberate large quantities of mineral food. If there is enough humus in the soil, this new food is not washed out by rain, but is almost entirely retained for the crop of the following spring. The ploughing has also the further advantage of burying weeds and of forming the soil into ridges. These ridges dry out much earlier than the rest of the soil and thus allow of an early sowing when the right time arrives.

HOEING is another form of tillage which is decidedly beneficial. It clears the land of weeds, exposes injurious insects to the birds which prey on them, assists the weathering of the soil by the heat of the sun, conserves moisture by preventing evaporation in dry weather, and raises the temperature of the soil to a marked degree. The difference between the temperatures of hoed and unhoed soils is often enough to account for growth on the one and dormancy on the other at the same time.

DRY FARMING is a method of raising crops in districts where the rainfall in any one year is not enough to produce a profitable crop. If no special steps were taken in such conditions, each shower would be wasted by evaporation and drainage almost as soon as it fell, and there would be no accumulation of moisture. But by compressing the subsoil by rolling with heavy, edged discs, and keeping the surface very loose with horse-hoes, the moisture is encouraged to rise up to root level by capillary attraction and is prevented from rising any farther by the blanket of loose soil above that level. A crop can thus be obtained every two or three years with reasonable certainty.

Manuring has two aspects. The first is the making good of deficiencies in plant food, *i.e.*, the supply of essential elements which are not present in sufficient quantity; the second is the maintenance—or increase—of plant food in general. Plants do not derive the main part of their dry content from the soil, but from the carbon dioxide of the air and from water, with which two substances they make the simple sugar from which all food is derived.

[*By courtesy of the Publicity Dept. of the Commonwealth of Australia.*

An Artesian Bore in South Australia.

The poor nature of the grassland is plainly visible in the background.

But although very little is taken from soil, that little is essential, and the smallness of the plant's requirements gives the farmer his opportunity to exercise a powerful influence over the yield of crops.

By the expenditure of a few bags of some chemical fertiliser per acre, he can restore the balance of the soil content, and so bring to his granary tons of carbon, hydrogen and oxygen in various food forms. Moreover, by carefully preserving all vegetable and animal waste and returning it to the land, he can reduce the amount of mineral depletion to a minimum. He may even find it very profitable to purchase *all* the necessary fertilisers and supply the soil with a complete manure.

THE ROTATION OF CROPS is usually taken to mean the growth of different kinds of plants in a systematic order or rotation. In general this is correct, but in intensive farming there is *combination*, as well as rotation, of crops. The rotation of crops is based on the fact that different plants make different demands on the soil, and that some even add to it what others need. The Norfolk, or four-course rotation, is a typical arrangement of this kind, and depends on the fact that the crops successively grown[1] gain their soil foods at different depths and in such different proportions as to utilise the available resources very fully. In addition, the leguminous plants grown actually increase the amount of nitrogen in the soil. They do this by affording a home in their roots for certain bacteria which have the power of collecting and fixing the atmospheric nitrogen, with the result that, when the roots decay, this nitrogen becomes available for the crops which are grown later.

Even in the pastoral industry, where no tillage at all is done, the farmer can make an enormous difference in the fertility of the land under his control. A wise decision as to when and to what extent an area shall be put under stock, and what type of stock shall be allowed to graze on it, is enough to enable an experienced pastoralist to improve his land considerably and to change the character of the herbage it supports without sowing a single seed.

Pastoral Industry

Animals are reared all over the world for a variety of purposes. Some are kept for their strength as beasts of burden, *e.g.*, the horse, the elephant, the ox. Some are reared mainly because they yield food or clothing, or both, *e.g.*, sheep for meat and wool; cattle for meat, dairy produce, hides, and other by-products; pigs primarily for food; goats in semi-arid regions for their wool or hair, and often for their milk and flesh. The reindeer of the tundra is used mainly as a beast of burden, but it may some day become important as a source of meat.

---

[1] Although the actual crops grown as well as the methods of rotation are of almost endless variety, the basis of the system is to grow each year on one-fourth of the land one of four types of crops, *viz.*:—(1) a root crop, *e.g.*, turnips, swedes, potatoes or beet; (2) a cereal, *e.g.*, barley; (3) a leguminous crop, *e.g.*, beans, clover, vetches or lucerne; and (4) another cereal, *e.g.*, wheat or oats. (1) and (3) are known as *cattle crops*, and (2) and (4) as *food crops*, so that each year one half of the land is used for each of these two groups.

The distribution of animals, as regards both types and quantities, is mainly determined by natural conditions, but is much influenced by man. Thus, certain races of men are forbidden by their religion to eat the flesh of certain animals or even of any animal. Again, in the temperate and cold countries, meat is a highly valued and sometimes essential food, although it often approaches the status of a luxury.

Animals require a large area in which to roam and feed, and consequently the great stock-raising areas of the world exist in those countries which have extensive grasslands. In Japan, for example, the mountainous nature of the country and the dense population leave little or no room for pastoral occupations, whereas the sparsely populated expanses of Australia, South America, and western North America are great stock-raising regions, producing dried, canned, frozen and chilled meats as well as wool, hides, tallow and other products. In these regions and for these products good transport facilities are, of course, essential, and it may be observed that these great pastoral expanses are gradually being given over to arable farming, and the rearing of stock tends to be confined to those regions which are unsuited to the plough.

Climatic conditions are powerful factors in determining the distribution of animals. Horses, cattle and sheep are not reared to any great extent in fly-infested areas and are unknown in the tundra; sheep reared for wool thrive best in a drier climate than that which suits sheep reared primarily for meat; dairy cattle are most productive in a moist, cool, temperate climate where rich grass can grow, whereas "beef" cattle are better adapted to drier conditions and coarser herbage. Moreover, dairy cattle have to be milked both night and morning, so that only *intensive* farming is possible in their case, whereas "beef" cattle (with less exacting requirements in food and attention) can be more profitably reared on wide, open spaces where they can roam at will in search of food.

In the sparsely populated grasslands of the Southern Hemisphere, the animals rarely have to be housed during the winter months, and, as land is cheap, they are allowed to roam freely throughout the year and little labour is required. In the cool temperate lands of the Northern Hemisphere not only do the animals need to be sheltered and stall-fed during the colder months, but land and labour are dear. Consequently, these areas can compete successfully with the pastoral areas of the Southern Hemisphere only if great skill is applied to make the land yield highly and only if mixed intensive farming is practised. The nearness of the markets makes this profitable.

Arable Farming

Arable farming (by which is implied the cultivation of the soil) is the basis of all industrial and commercial activities and is the primary industry of all countries with a native population. Without it, the great industrial countries of to-day could not prosper, for the miner, the factory hand, and all engaged in manufacture and industry necessarily depend on the products of the soil for their food, clothing and shelter, as well as for the raw materials of their industries.

The nation most favourably situated to-day is that which possesses a sufficiently high agricultural productivity to feed the dense populations of its industrial centres. In this respect, the United States of America are almost ideally placed, for with one or two exceptions (*e.g.*, rubber and tea) that country can produce all the agricultural products it requires, while it possesses vast resources of industrial minerals, such as coal, petroleum and iron, to support its wide range of manufactures. Great Britain, on the other hand, has to depend on other countries for the greater part of her food supplies and raw materials, and is thus indirectly dependent on the outside world for the continuance of her great industries.

The distribution of agriculture and of the different agricultural products is primarily dependent on climate, soil, the type and quantity of labour, and on transport facilities.

The most prolific yields are obtained in regions of abundant heat and moisture and of fertile soils, *i.e.*, in the equatorial lands, but here the native population is so backward and conditions are so detrimental to land work that agriculture is commercially unimportant. The monsoon and savannah areas, such as India, China and the Sudan, have a more advanced type of agriculture, producing their own food and raw materials. The greatest agricultural progress, however, has been made in the forest clearings of the temperate lands, particularly in the Northern Hemisphere. This advancement has occurred in spite of climatic obstacles and the difficulty of preserving the soils, because the pressure of increasing population which has accompanied the development of industry and commerce has acted as an irresistible driving force. In western Europe and eastern U.S.A., especially, the intensive, scientific agriculture which is so widely practised owes its development to the extreme pressure of population, which has raised the value of land and forced farmers to study the properties and requirements of soils and crops. In other parts of the world, too, intensive farming is becoming more general, for even in the so-called " new " countries (where scarcity of labour is offset by the use of machinery) the careless use of the soil and the neglect of the principles of crop rotation and manuring, have so tended to reduce the fertility of the land under extensive methods that a change has had to be made in the direction of intensive cultivation.

In certain areas, such as Manitoba and Saskatchewan, *mixed farming*, or the raising of both stock and crops, is carried on, but usually one type only is predominant. In arid and semi-arid regions *irrigation* (see Chapter 8) and *dry-farming* are employed. By the resort to dry-farming, as we have seen, rainfall is conserved in the soil and use is made of any available underground water (see p. 37). Farmers in the dry-farming region of western North America, for example, are enabled in this way to raise a wheat crop once in two years, while in the intervening alternate years they allow the land to " rest " and store up water for the crops of the following year. In many semi-desert regions the tractor makes it possible to carry on dry-farming where otherwise drought would spoil two crops out of three.

MANURING (see p. 38) is employed to assist crop growth by supplying food (nitrogen, phosphorus and potassium) which is not present in the soil in sufficient quantity. Nitrogen is obtained from a variety of sources : from the enormous *nitrate* deposits of the Chilian desert, from the ammonium sulphate of the coke-oven industry and coal-gas works, and from the combustion of the nitrogen and oxygen of the air in an electric arc generated either by water-power (Norway) or by by-product gases. *Phosphates* are mined in Florida, Tunis, Algeria, Nauru and Ocean Island, and are also prepared from bones and from powdered slag in ironworks, while *potassium* or *potash salts* are mined at Stassfurt (Germany) and in Alsace (France).

MAN'S CLOTHING

The raw materials for cloth are mainly vegetable fibres. Wool, the notable exception, is next to cotton the most important of the raw materials of the textile industries.

COTTON

Cotton is a woolly fibre which grows in tufts attached to and enveloping the seeds of a shrubby plant. When the seed-pods or bolls are ripe and have opened, the fibrous covering swells out in a mass about as large as a small apple, and can thus be easily picked. The plant is naturally a sub-tropical product, although it can be and is cultivated successfully in the Tropics at some distance above sea-level, where the proper conditions of moisture and sunlight exist. In the tropical parts of India, for example, cotton is cultivated at a height of at least 1,000 ft. above sea-level.

The *northern* limit of commercial cultivation lies about 40°N. Thus, the limit in the United States is between lat. 37°–38°N., in China and Japan lat. 41°N., in Chinese Turkestan lat. 42°–43°N., and in Russian Turkestan lat. 40°N. This limit is determined generally by the cotton plant's essential requirements of seven months of frost-free weather, a good, but not excessive summer rainfall, plenty of bright sunshine and uniformly warm weather without excessive heat.

In the United States, the *western* limit of cultivation is determined by the isohyet of 23 inches, although much of the cotton belt has over 40 inches of rain. The Indian cotton areas have a rainfall of between 20 and 40 inches, but the best Indian and Egyptian cotton is grown under irrigation. The lack of sufficient direct sunlight has prevented the successful cultivation of cotton in the more cloudy regions of the torrid zone, while the beneficial effect of a sharp winter in keeping down insect pests has led to the production of both the greatest quantity and best quality of fibre in regions outside the tropics. Another reason for this is that the cotton plant is one which, unless it is destroyed and re-planted each year, yields a deteriorating quality of cotton, so that seasonal frost and drought are beneficial because they enforce the renewal of plantations and thus ensure the maintenance of good quality. Briefly, this means that *the cotton plant is most productive in the districts near to the Polar climatic limits within which it can be successfully cultivated.*

Other important factors determining the distribution of cotton cultivation are limestone soils or rich sandy loams (although cotton can be grown fairly well on poor soils), good transport facilities, and cheap labour for the relatively unskilled work of planting, hoeing and picking.

Types of Cotton

Cotton belongs to the genus *gossypium*, of which there are three main species, all differing in size, in the colour of the flower and in the strength, fineness and length of the fibre. The best and finest cotton is produced by the species *gossypium barbadense*, otherwise known as "Sea Island" cotton because it was first cultivated in the United States on the islands off the coast of South Carolina and Georgia. This variety has a beautiful appearance in the mass, and the fibre is longer, finer and stronger than the fibres of other varieties. The average length of the staple is 1.6 inches[1] and the flower is yellow in colour.

The best cotton of this type is grown on the islands off the coast of South Carolina and in the West Indian Islands, but an inferior variety is grown in Egypt, and a still lower grade in Florida and Georgia on the mainland of the United States.

The most extensively grown species of cotton is *gossypium herbaceum*. of which *gossypium hirsutum* is a variety. The latter is the most important, as it comprises the American "upland" cotton so widely grown in the United States. The herbaceum species is a native of Asia, and is cultivated largely in India, China, Indo-China, the East Indian Archipelago and Italy. The average length of the staple is about one inch in the United States, and slightly less elsewhere.

The South American cotton plant is termed *gossypium peruvianum*. It yields fibre of good quality, slightly shorter than "sea island" cotton.

The by-products of the cotton plant are important, and it has been estimated that they increase the value of the cotton crop by 25 per cent. When pressed, the seeds yield oil and oil-cake—a valuable fertiliser and cattle food—while the leaves and stalks provide fertiliser, forage and fuel. The cheapest fertiliser in the cotton districts is the cotton oil-cake itself which is fed to cattle wintering in the cotton fields.

---

[1] Cotton in which the fibres are less than 1⅛ inches long is called "short-stapled"; when the fibres are 1⅛ inches or over in length the cotton is called "long-stapled."

Principal Cotton-Growing Countries

These are shown in the Table below and in Fig. 90. The average yearly production in thousands of metric tons was 4,796 for the years 1909–13, and 5,705 for the years 1925–29. The world production for the season 1932–33 was 5,110,000 metric tons. It will be noted that the United States produce over 50 per cent. of the total world crop, the next most important producers being India, China, Egypt, the U.S.S.R. and Brazil.

Production of Cotton

AVERAGE PER YEAR IN THOUSANDS OF METRIC TONS.[1]

Countries.	1909–13	1925–29	1932–33
U.S.A.	2,825·8	3,310·5	2,818·9
India	770·0	1,025·9	819·4
China	482·5	410·3	490·0
Egypt	315·0	342·4	222·7
U.S.S.R.	196·0	235·9	390·0
Brazil	90·7	114·8	75·4
Mexico	43·7	54·8	22·0
Peru	26·1	49·7	52·6
Corea	4·2	29·8	29·4
Uganda	4·4	28·1	52·6
Sudan	3·1	27·4	26·4
Argentina	·6	21·4	35·0
Turkey	22·1	20·3	6·1
Persia	24·0	17·1	22·5

---

[1] Metric Ton – 2,204.6 English lbs. [2] In many cases the figures 1925-9 quoted throughout refer not to the calender years but to the seasons, *e.g.*, 1925 may refer to the year included in the season commencing in mid-1925 and ending in mid-1926; similarly 1929 may represent the season 1929-30.

[3] In all the chapters dealing with commodities the expression " Europe " *excludes* European Russia, whilst the term " U.S.S.R." *includes* both European and Asiatic Russia.

THE UNITED STATES. The raw cotton producing area of the United States is confined to the south-east, and extends from Norfolk (Virginia) on the east to Austin (Texas) in the middle west and as far north as Memphis. Generally speaking, the area corresponds with the region having the " Gulf " type of climate. In the west it is bounded, as has been said, by the isohyet of 23 inches and in the north by the line representing the limit of 200 frostless days. The greater part of the crop is of the short-stapled upland variety.

The principal cotton State is Texas. Next follow Georgia, Mississippi, Alabama, South Carolina, Oklahoma, Arkansas, North Carolina and Louisiana. There are, however, three cotton areas of special importance—the "Black Waxy Prairie" of Texas round Wichita Falls in the north-west and round Houston, Austin and Dallas; the " Mississippi Bottoms " of Mississippi and Tennessee between Memphis and Vicksburg, which are fertilised by occasional inundations ; and the " Black Belt ", stretching north-east from Alabama, situated in a decomposed limestone valley (see Fig. 89). In western U.S.A. cotton is grown under irrigation in southern California and Arizona.

The cotton boll-weevil is the great pest of the United States cotton crop. Throughout the whole belt it has caused a great deal of damage, widespread loss and endless difficulty to the cultivators. At the present time it is being scientifically fought in a number of ways. The cotton fields are being sprayed with insecticide (calcium arsenate) from low-flying aeroplanes; new varieties of cotton are being tried in the hope of finding kinds which the weevil cannot or will not attack, while every endeavour is being made to introduce and foster the growth of natural enemies of the pest.

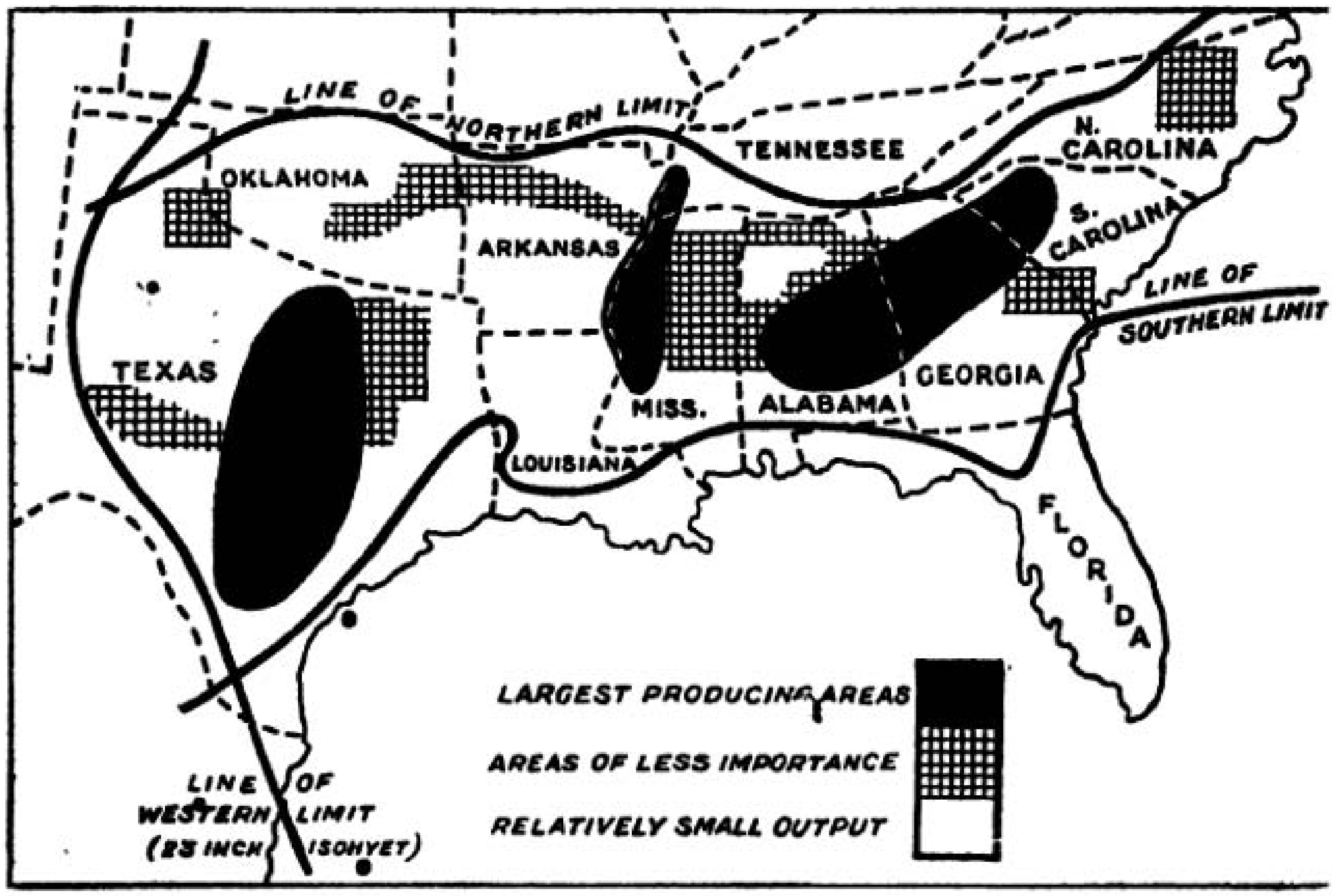


FIG. 89: THE MAIN COTTON BELT OF THE U.S.A.

Cotton picking is essentially an occupation for cheap labour, for no satisfactory mechanical picking machine has yet been evolved. Hence it is no coincidence that the principal cotton belts have a dense negro population, for it was the demands of the cotton crop that supported the American slave trade. The work is light, and many women and children are employed.

The average yield per acre of American cotton varies markedly, and naturally has an important effect on world prices of the raw material. In 1933 the average was 170 lbs. per acre; in 1931 it was 209 lbs. per acre; whilst for the years 1927-31 the average was 168 lbs. per acre. Cotton is the leading "money" crop of the United States, and a large proportion of the total output is exported, mainly to Britain, Japan and China.

India produces short-stapled native cotton in the "black cotton soil" region of the north-west Deccan, a region of tenacious, moisture-retaining soil which receives practically the whole of its rain during summer from the south-west monsoon. This area provides the raw material for the cotton industry of Bombay, and also provides Bombay with an important export.

Cotton is also grown in southern India, while the plains of the Indus and the Ganges rivers grow under irrigation American cotton of better quality than the Indian variety. The greater part of the Indian cotton is grown in areas with a rainfall of less than 40 but more than 20 inches.

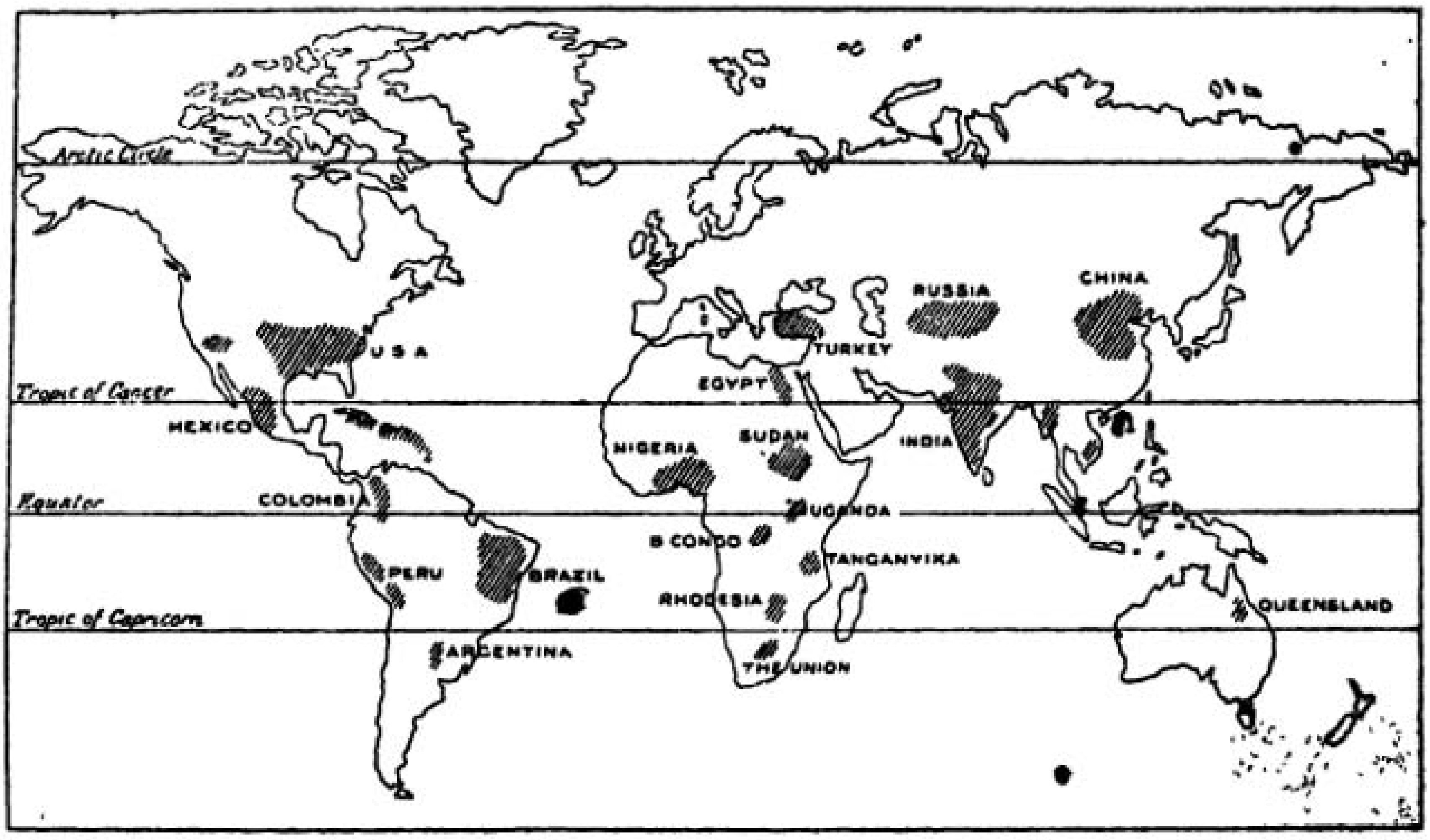


Fig. 90: Raw Cotton Producing Countries.

Indian cotton is of poorer quality and yield than that of the United States, the average yield per acre being under 100 lbs. Although the quality is improving, its poorness still prohibits its use to any great extent in Britain, and it is mainly exported to Japan, China and Southern Europe.

China follows India as a cotton producing country, but the whole of the crop is now used internally. The principal producing areas are the Great Plain of the north and the valleys of the Hwang-ho and Yangtse rivers.

Egypt possesses the best cotton producing land in the world, and yields the greater part of the world's fine cotton. The cotton is grown under irrigation in middle Egypt adjacent to the Nile, and also in the Nile delta (average yield about 400 lbs. per acre—*cf.* India), where the land is fertilised by inundation and where there is almost continuous sunshine. In the former area, and also in the *Sudan*, great irrigation works have been, and are still being, constructed for the supply of water to the cotton growing districts.

U.S.S.R. The cotton growing area of Central Asia is centred in the Ferghana Basin, which supplies nearly all the cotton required by the Moscow industrial region. The cotton is grown under irrigation in the oases of the semi-deserts and deserts. Its cultivation was greatly extended as a result of the construction of the railway from the Caspian Sea, and the joining of this line to the Trans-Siberian railway will doubtless lead to still further extension, more especially as it will make possible the transport of wheat from the northern wheat lands, and so free for cotton cultivation land which is at present devoted to wheat but which is quite suitable for cotton.

SOUTH AMERICA. Of the South American States *Brazil* produces the greatest quantity of cotton, although the fibre is coarse owing to the excessive heat. The principal area is around Pernambuco. The irrigated desert coast of *Peru* grows cotton of excellent quality, the arid climate making the fibres crinkly, a property which gives them special value for mixing with wool.

AFRICA, outside Egypt, is not at present of great importance as a cotton producer, although great efforts are being made to increase cotton growing, particularly in the countries belonging to the British Empire. The greatest success has been achieved in the *Sudan* (already mentioned) and *Uganda*, whilst other producing areas are the *Union of South Africa*, *Nigeria*, *Rhodesia* and *Tanganyika*.

Commerce in Cotton

Over half the cotton crop of the world enters into international trade. With regard to general import and export the Tables given below speak for themselves. In the import trade, the decrease in imports to Britain and the increase to Japan are noteworthy. Britain is meeting with increasing competition in her cotton industry, mainly from Japan, but also from other Eastern countries, such as India and China. In this connection it is worthy of note that, whereas in 1917 China was an exporter of cotton, she now imports considerable quantities. The disappearance of Austria and the appearance of Czechoslovakia in the list of importing countries are, of course, co-related, for Czechoslovakia includes the industrial part of pre-war Austria.

The most notable feature of the export trade during recent years is the decrease in exports from India as compared with 1913 and 1929. The surplus cotton of the United States is exported to European countries, particularly Great Britain, and also to Japan and China, but a large and increasing part of the crop is now being utilised in American industries. Britain is the largest consumer of the high quality Egyptian cotton, but some finds its way to the United States, and to continental countries. Imports into Russia have declined as a result of increased home production, and, in Britian, the decreased consumption is a result not only of foreign competition but also of the rise of the artificial silk industry.

Exports of Raw Cotton[1]

AVERAGE PER YEAR IN THOUSANDS OF METRIC TONS.

1909–13			1925–29	1932
U.S.A.	1,956	U.S.A.	1,962	2,151
India	413	India	623	195
Egypt	313	Egypt	328	301
China	43	Peru	48	46
Persia	27	Uganda	31	38
Peru	19	Sudan	23	38
Brazil	18	Mexico	22[3]	4
Turkey	18	Persia	17	22

---

[1] The trade figures in this and other Chapters are *net* figures, *i.e.*, net exports after deducting any imports and net imports after deducting any exports.

Imports of Raw Cotton

AVERAGE PER YEAR IN THOUSANDS OF METRIC TONS.

1909–13			1925–29	1932
U.K.	905	U.K.	696	544
Germany	411	Japan	633	700
Japan	311	Germany	335	306
France	243	France	331	243
Austria	194	Italy	212	190
Italy	194	U.S.S.R.	129	10
U.S.S.R.	192	Czechoslovakia	124	79
		China	58	184

WOOL

Wool is one of the most extensively used of fibres for man's clothing. It is more durable than cotton, and in cool climates it is in great demand because it conserves body heat. It is obtained from many animals, of which the most important are the sheep, the goat, the alpaca, the llama, the vicuña and the camel.

Of the many different kinds, *sheep's wool* is by far the most widely used. The best wool-producing sheep is the "merino", which is indigenous to North Africa, and which in the 18th century was introduced into Australia with marked success. It has been successfully reared also in Spain, South America, South Africa and New Zealand. Merino sheep are valueless for mutton, and, in Australia and New Zealand particularly, cross-breeds of original English and merino sheep are reared which not only yield wool that is almost as good as pure merino but also give excellent mutton. The sheep-rearing dominions of the Empire have also large numbers of the original English breed of sheep.

The sheep is naturally adapted to the drier regions of the world. Its small mouth fits it to graze on short, tough grass, and its liability to foot-rot prevents it from thriving on the lush meadows so beloved by cattle. The most suitable conditions are a rainfall of 20–30 inches and a temperature free from great extremes of heat and cold. In Britain, the sandy moorlands and the dry chalk and limestone uplands are the best sheep-rearing areas. Indeed, in Western Europe generally, where the rainfall is not by any means high, the sheep are grazed on the drier and less fertile grasslands and moors. It is, however, in the temperate grasslands of the Southern Hemisphere, such as Australia, South Africa, New Zealand and South America, that most sheep are reared, and in the vast expanses of grass land in these countries sheep flourish even where conditions approach very near to those of deserts. In the Northern Hemisphere the temperate grasslands are too cold in winter for large-scale sheep farming.

In Australia the provision of adequate water supplies is a source of great difficulty. Lack of grass is a small factor, since the sheep can feed on the salt-bush which is the only vegetation in times of drought, but lack of water may result in the loss of millions of sheep. Irrigation by means of artesian wells is consequently practised, and has gone far to remove the terrors of prolonged drought. In some districts, too, the difficulty is being overcome by the recent practice of discontinuing wheat culture in richer areas (*e.g.*, river flats), and substituting crops of lucerne and alfalfa. This is packed newly cut into silos and fed when required to sheep or cattle. In this way a moist succulent food is available when drought prevails, and the sheep farmers are to some extent safeguarded against the risk of a recurrence of the disasters suffered by them a few years ago.

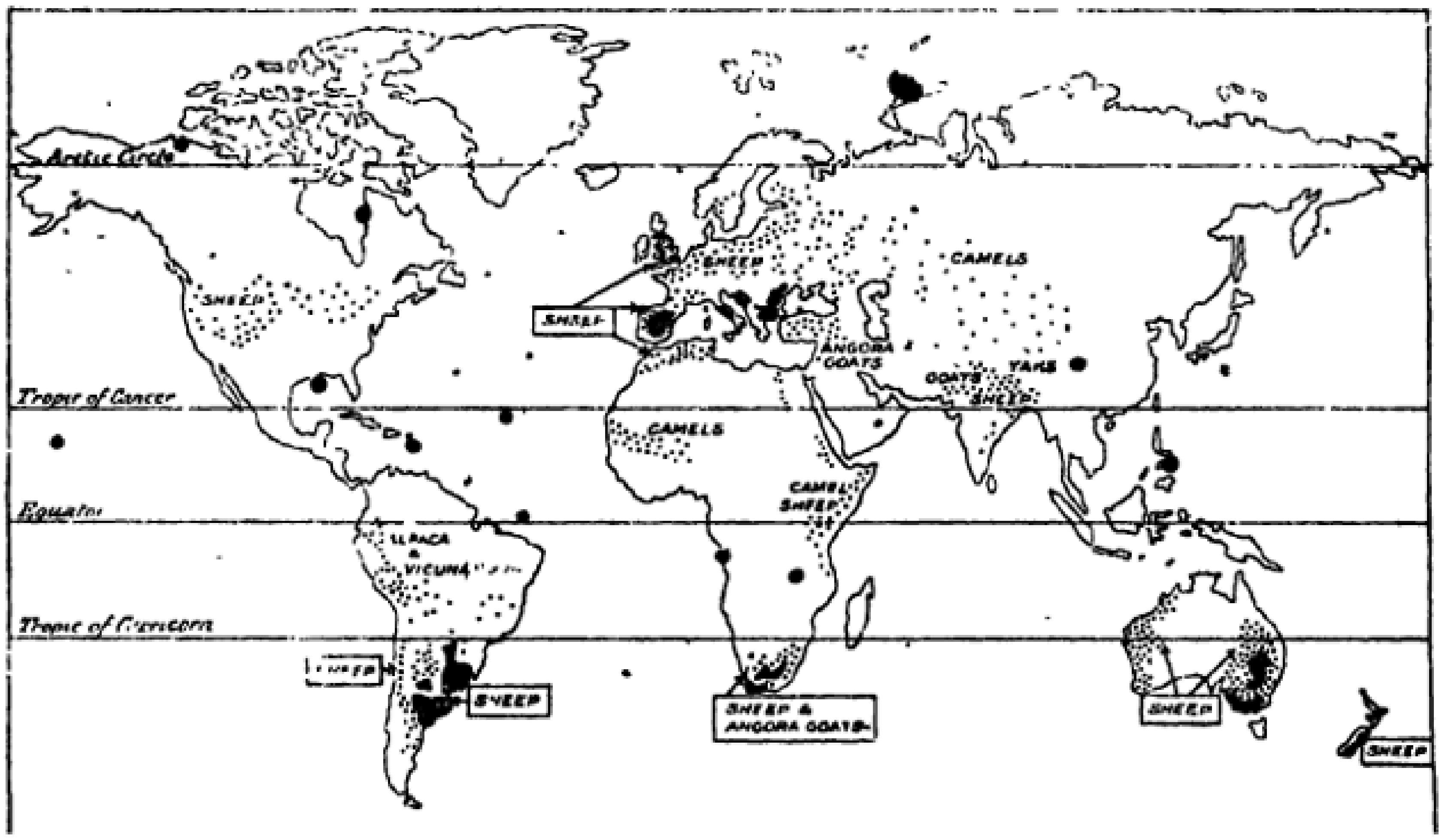


FIG. 91: WORLD DISTRIBUTION OF SHEEP AND OTHER WOOL AND HAIR PRODUCING ANIMALS.

Other Wool Producing Animals

The *Angora goat* is an important wool-producer, the fine lustrous fibres of its fleece providing the wool known as "mohair". The animal is native to Asia Minor, having obtained its name from the town of Angora in Asiatic Turkey, but it is reared for its wool chiefly in South Africa.

Mohair is used for the manufacture of plush and similar fabrics. The demand for it has increased markedly of late, owing to the extension of the cinematograph industry and the consequent demand for plush-covered seats for the numerous cinemas of this and other countries.

The *Tibetan* or *Kashmir goat* (a native of Tibet, Kashmir and southern China) produces a wool of soft texture which is made into "Cashmere" shawls, but the name "cashmere" is now used to designate any fine, soft, woolly material.

The *Alpaca*, a native of Peru and Bolivia, is domesticated in flocks. Its wool is used for linings, braids and light cloths. It became important in the woollen industry following the invention in 1836 of the material now called "alpaca" by Sir Titus Salt, whose factory on the Aire, near Bradford, gave rise to the new town of Saltaire. Peru and Bolivia produce the entire world supply, which they export from Arequipa and market in Liverpool.

The *Llama*, a Peruvian beast of burden, produces a wool equal in quality to Alpaca "seconds". It is used to adulterate alpaca.

The *Vicuña*, a small wild animal found in Peru and Bolivia at altitudes above 13,000 ft., is not now important as a wool producer, although its wool is one of the finest of all textile materials.

The *Camel* gives hair and wool, the former from the mane and hump, and the latter from the down on other parts of the animal's body. China and Turkestan are the chief producers, the hair being sold in London.

World Production and Countries Producing Sheep's Wool

The world production of wool for the year 1933 was 1,600,000 metric tons, as compared with the average production for the years 1909-13 of 1,490,841 metric tons. The principal producing countries with the amounts produced are shown in the following Table, which gives the average production for the years 1909-13, the production for the years 1929 and 1933 and the numbers of sheep for the years 1913, 1929 and 1933.

Production of Wool and Numbers of Sheep

	Wool: Thousands of Metric Tons.			Thousands of Sheep.[1]		
	1909–13	1929	1933	1913	1929	1933
Australia ..	336	439	410	85,057	106,126	112,000
Argentina ..	163	146	167	43,225	36,209	44,000
U.S.S.R. ..	145	174	100	111,051	124,757	52,000
U.S.A. ..	144	165	197	37,773	47,171	52,000
New Zealand ..	90	101	118	24,182	27,134	29,000
South Africa ..	75	141	122	35,808	42,500	48,000
Uruguay ..	71	61	54	26,286	22,500	21,000
U.K. ..	61	53	54	24,279	23,968	27,000

[1] India is fifth in order of the sheep-rearing countries but the production of wool is relatively small.

AUSTRALASIA. *Australia* not only leads as a wool-producer but her production represents about 50 per cent. of the world production of fine merino wool. The rearing of sheep for the production of wool is, indeed, the basis of the Australian pastoral industry and of her export trade—less than 6 per cent. of the wool production is used locally. Most of the sheep are reared in the south-east, particularly in New South Wales, which State rears about half the total sheep and produces about half the total wool output of the continent. Next in order of importance are Queensland and Victoria. As sheep are a " product " of temperate lands they are found in Australia mainly in the temperate regions with a rainfall of from 15 to 30 inches. The rearing of sheep for mutton is not making much headway in the Dominion at present owing to the depressed state of the world's meat markets. Drought is the greatest danger of the wool industry, the numbers of sheep and therefore the production of wool fluctuating with variations in rainfall.

New Zealand is suited to the rearing of a variety of breeds of sheep because of the varied relief. The hilly and down districts of South Island support the merino sheep, whilst in North Island, where the climate is moister, the Romney breed is the most important. Cross-breeds also are reared, particularly on the dry Canterbury Plains.

SOUTH AMERICA has an important wool-producing region centred in the River Plate district. The sheep are reared mainly in the region with a rainfall of from 20 to 40 inches in *Argentina* and *Uruguay*. In Argentina the extension of the area under cereals is pushing the sheep-runs further south to the drier Patagonia district.

NORTH AMERICA. There is a large production of wool in the *United States of America* but it is not of good quality and is all home-consumed. The leading States are Pennsylvania, Ohio, Illinois, Wyoming, Montana and Texas. In *Canada*, about two-thirds of the total sheep are found in southern Ontario and Quebec. The climate of Canada in winter is too cold for sheep and the production of wool is relatively small (about 10,000 metric tons yearly).

THE U.S.S.R. is a large producer of wool but the amount produced varies and the wool is coarse and all home-consumed. The sheep are found mainly on the steppe land to the south.

SOUTH AFRICA, like Australia, bases its agricultural and pastoral industries on the rearing of sheep for wool. Most of the sheep are reared on the High Veld towards the east, where the rainfall averages from 20 to 40 inches. The sheep are mainly merinos crossed with other breeds. A further similarity with Australia is the danger of drought. There is also the danger of disease, which is combated by frequent " dipping ".

EUROPE has a large production of wool but the output is almost wholly consumed in local manufactures and has to be supplemented by imports from the great wool-producing countries of the Southern Hemisphere, although wool of a special type is exported in small quantities to other countries, notably to the United States. *Great Britain* is the largest individual European producer.

Commerce in Wool

Australian wool is exported largely to the U.K. (34 per cent.), France (24 per cent.), Germany, Belgium and Italy (24 per cent.), and America and Japan (16 per cent.). Sydney is the principal market of the world for raw wool. Formerly London was the only market for Australia's exports, but now Australia supplies direct to other countries and London finds rivals in Antwerp, Marseilles, Hamburg and New York. River Plate wool is exported chiefly to France, Belgium, Germany and the United States. Some of it comes to Britain, but it is very greasy and is not favoured by British wool buyers until after it has been scoured. In France and Belgium (*e.g.*, at Verviers) special machinery for dealing with greasy wool is in use, and part of the scoured wool is re-exported without being further treated. New Zealand exports to the United States, but the greater part of the New Zealand and South African wool is exported to the United Kingdom. The pre-war and present positions of the leading importing and exporting countries are shown in the following Table. A notable feature is the increased imports into Japan.

Commerce in Wool

AVERAGE PER YEAR IN THOUSANDS OF METRIC TONS.

Exports.				*Imports.*			
	1909–13	1925–29	1932		1909–13	1925–29	1932
Australia	283	333	387	U.K.	193	181	244
Argentina	145	134	131	Germany	186	153	126
New Zealand	85	100	108	France	174	211	186
South Africa	66	113	169	U.S.A.	92	127	24
Uruguay	63	54	43	Belgium	47	48	40
				U.S.S.R,	38	27	26
				Italy	12	42	65
				Japan	4	42	93

JUTE

Jute is a fibre obtained from the plant *corchorus capsularis*, which grows about eight to ten feet high and succeeds best in a hot, damp climate on the outer margin of the Tropics. At the present time jute is mainly used to make sacks for the carriage and storage of grain. Originally these jute sacks were bought from the peasants of India and they were known as " gunny bags ", but, with the increase in the growth of wheat in other countries, the making of gunny bags became an important industry in Great Britain. In addition, jute is now used for hessian canvas, tarpaulins, sail cloth, prayer-mats and similar objects. It is not so durable as linen or cotton, and it will not bleach white, but owing to its low cost of production and cheapness it is very widely used for the rougher kinds of fabric and for adulterating superior types of fibre.

Production and Trade

Almost the whole of the world supply of jute is grown in *India*—in Bengal, Assam, Bihar and Nepal. Efforts are being made to grow it in the Punjab, the Central Provinces and Madras. The average yearly Indian production in the years 1909-13 was 1.54 million metric tons, and in 1933 about 1.30 million metric tons. Formosa, Japan and Indo-China have a small production, while experiments in the Sudan and West Africa have been favourable, but production outside India is still insignificant, amounting in all only to about 6,000 metric tons.

Certain natural advantages account for India's leadership as a producer of jute. The fibre has to compete in the economic market with flax, cotton and hemp, and, being an exhausting crop, it could not possibly do this were it not for the fact that the soil in which the major supplies are grown in the flood plains of the Lower Brahmaputra and the Ganges is renewed " gratis " by the yearly floods of those rivers. In other areas without this advantage the crop cannot be grown anything like as profitably.

India exports about 60% of her output, mainly to the United Kingdom, Germany and France, less important importers being Italy, the United States and Spain. Dundee is the only jute manufacturing town of importance in Britain. In this town the rise of the industry was due to the discovery that jute could in many cases be used as a substitute for hemp, and subsequent developments established Dundee as the greatest jute-importing port in the world.

HEMP

HEMP FIBRE proper (*cannabis sativa*) is largely a product of temperate lands. It is not used for clothing, but as it is durable and strong it is in great demand for ropes, twine, sailcloth, canvas and cordage. The plant is annual, requiring a mild climate and humid air, with a rich, loamy soil able to retain moisture. Frost is fatal to the plant, but, owing to its rapid growth, it forms its seeds before frost comes, and is thus harvested before the onset of winter. Pre-war and post-war production is shown in the following Table.

Production of Hemp

IN THOUSANDS OF METRIC TONS.

1909–13 (*average*).			1929	1932
U.S.S.R.	320	U.S.S.R.	315	276
Italy	84	Italy	90	55
Poland	21	Yugoslavia	26	21
France	13	Poland	22	10
Spain	11	Corea	20	20
Hungary	11	Rumania	19	26
Japan	9	Japan	8	8
Corea	7	Czechoslovakia	7	6

Manila Hemp is the fibre of *musa textilis*, a plant of the banana family, and requires a hot, humid climate with an evenly distributed rainfall and well-drained soils. The fibre is strong and tough, and as it resists water-rot and will absorb tar well, it is largely used for the manufacture of ship's ropes. It is produced almost exclusively in the *Philippines*, where in 1929 the production totalled 213,000 metric tons, but in 1932 only 130,400 metric tons.

Sisal Hemp or **Henequen** is a fibre of a succulent plant *agave sisalana*, the name sisal being taken from that of the town Sisal in Yucatan (Mexico). The plant requires a tropical climate and humid air, but not heavy rain. It yields most fibre when grown on a poor soil, which must be well drained, and its length of life varies markedly accordingly to the conditions: it lives for about 6 years in East Africa and for 15 years in Mexico. As large areas must be planted and a factory with machinery erected on the spot, the industry can develop only with a large capital outlay and reserves. The fibre was first produced in Mexico as henequen, but later it was produced in British Honduras, Florida and the Bahamas as *pita* fibre. Its greatest development is to be looked for in East Africa, where the best quality fibre is grown, but it is also being produced in Madagascar, S.W. Africa, West Africa and Ceylon. It is used mainly for making binder-twine.

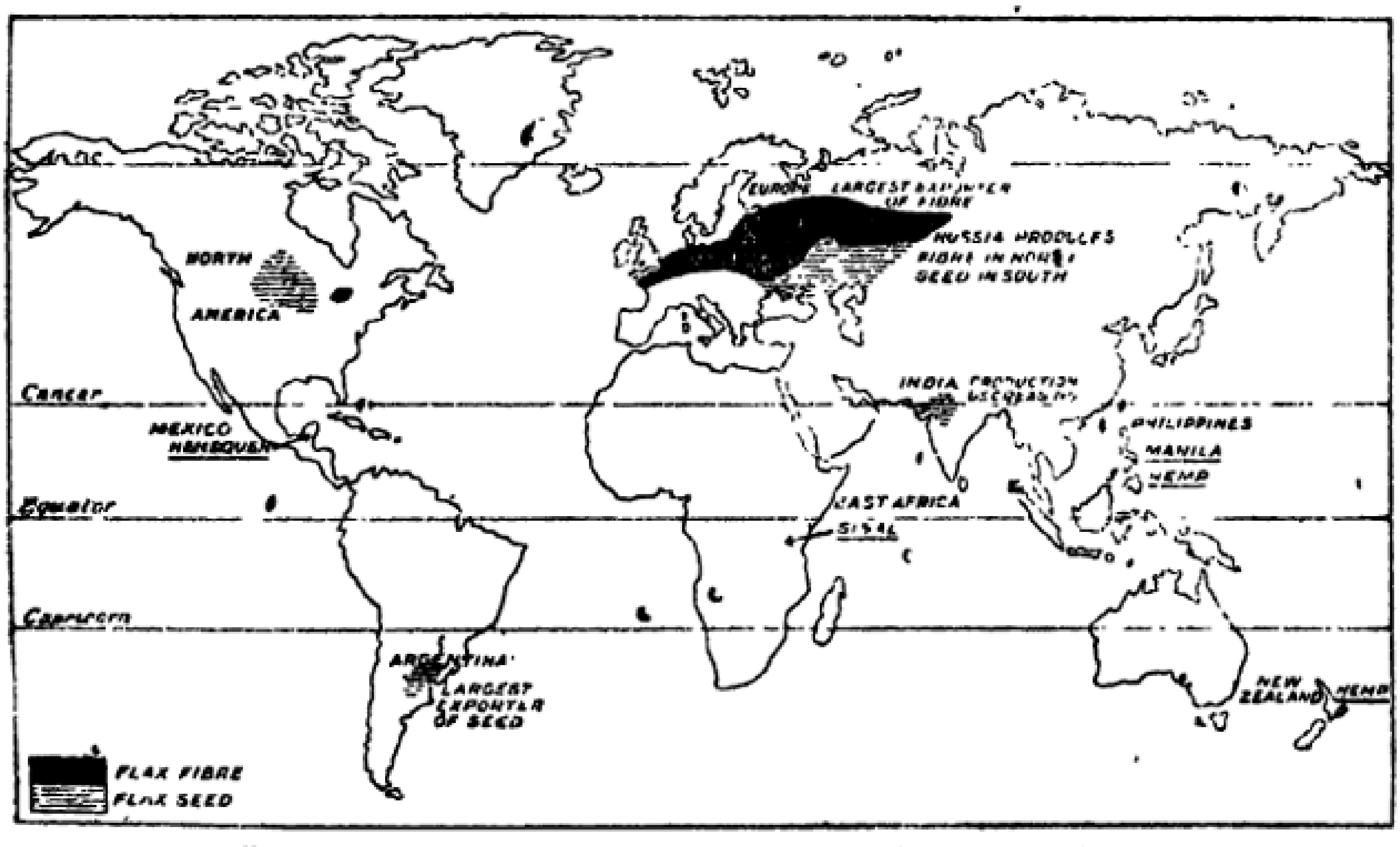


Fig. 92: World Distribution of Flax and Hemp.

Mexico produces 50 per cent. of the world's supply of sisal hemp (about 130,000 tons in 1913 and 88,000 tons in 1931). *Tanganyika* exported 20,000 tons in 1913 and 56,000 in 1931, while the other producers in order of importance are *Kenya*, the *West Indies* and *British Honduras*.

Phormium Tenax, or **New Zealand Hemp** (or *Flax*), is obtained from natural phormium areas in low-lying reclaimed swamp country in

New Zealand, especially near Hawke's Bay. The best qualities of the fibre are used almost entirely in the manufacture of binder-twine—the whole of the twine used for the harvest of New Zealand, and much of the binder-twine manufactured in Australia, being made from it. The fibre is also used in the manufacture of ropes and cordage, and the tow is used in upholstery.

FLAX

Flax is a plant (*linum usitatissimum*) which grows in both temperate and tropical climates.

In *temperate* regions it is grown for its *fibre* which, after being spun into thread, is widely used for the manufacture of fine cloth (linen) which forms an important item of man's clothing. Flax fibre is, indeed, the oldest textile fibre, and is now third in importance of the textile raw materials.

The flax plant flourishes best in the cool temperate zone, where it is free from excessive heat and drought. An equable climate and a clouded humid atmosphere are needed. Climate is a less important factor, however, than soil and labour: the soil should be level, moist well-drained, clean and firm or heavy. Careful preparation, manuring and weeding are essential and thus a large, cheap labour supply is needed.

In *tropical* and *sub-tropical* countries, flax is grown for its *seed* (linseed). Attempts to produce good fibre and good seed from the same plant have so far failed, the results of experiments having produced both inferior fibre and poor seed. Linseed, when crushed cold, yields about 20 per cent. of a very high-grade oil, almost colourless; if heated and crushed the yield is nearly 30 per cent., but the oil is amber-coloured. Linseed oil is a typical "drying" oil (it becomes solid by oxidisation on exposure to the air) and hence is much used for paints and varnishes as it forms a homogeneous horny skin which is very durable. Linoleum is made of ground cork mixed with vulcanized linseed oil and backed with canvas. The oil is also used for making putty and soft soap, and to some extent for hard soap. The seed residue is ground and compressed into oil-cake, which is one of the best cattle foods.

World Production and Trade

Europe is by far the largest producer of flax *fibre*, producing 99.5 per cent. of the crop. In 1932, the U.S.S.R. produced 500,000 metric tons out of a total world production of 600,000 metric tons.

Flax is grown for *seed* in *Argentina*, *India*, the *United States*, *Canada* and *Southern Russia*.

The production and trade figures for flax fibre and seed for the leading countries are shown in the following tables. The great importance of

Argentina as an exporter of linseed is notable. In 1932, the exports from Argentina rose to over 2 million metric tons, whilst those from India had fallen to 70,000 and from the U.S.S.R. to less than 1,000 metric tons. Canada *imported* linseed in 1932.

Production of, and Trade in, Flax Fibre

AVERAGE PER YEAR IN THOUSANDS OF METRIC TONS.

Production.	1909–13	1925–29
U.S.S.R.	513	347
Poland	42	56
Latvia	30	22
Lithuania	24	34
Belgium	23	26
France	18	24
Estonia	17	10
Northern Ireland	9	6
Netherlands	8	11
Czechoslovakia	—	11
Europe and U.S.S.R.	733	571
World	739	574

Trade, 1925–29.			
Exports.		*Imports.*	
France	81	Belgium	144
U.S.S.R.	50	U.K.	38
Netherlands	44	Czechoslovakia	22
Latvia	16	Germany	18
Lithuania	16	Japan	12

Production of, and Trade in, Linseed

AVERAGE PER YEAR IN THOUSANDS OF METRIC TONS.

Production.	1909–13	1925–29
Argentina	790	1,822
India	505	404
U.S.A.	496	519
U.S.S.R.	487	560
Canada	306	116

Trade, 1925–29.			
Exports.		*Imports.*	
Argentina	1,618	U.S.A.	522
India	220	Germany	343
Canada	57	U.K.	342
Uruguay	53	Netherlands	341
U.S.S.R.	25	France	185

SILK

Silk is the fibre spun by the caterpillar of the silkworm moth, and it is superior to all the other fibres in fineness and in length of staple. It was produced in China before 2000 B.C. and was introduced into Europe in the sixth century A.D. The silkworm feeds on mulberry leaves and will consequently flourish wherever the mulberry tree will grow. For commercial production, it is kept under cover and fed on leaves stripped from the trees.

On reaching the period of life at which it becomes a chrysalis, the silkworm throws out from its body two fine threads, which unite to form a single strand in which the chrysalis wraps itself, thus forming the cocoon. At this stage in the commercial production of silk, the insect is killed by heat, and the cocoon is unwound. The thread from a single cocoon is too fine for manufacture, so that the threads of five or seven cocoons are joined together to make the finest silk fibre, while threads from as many as 20 cocoons are used for coarser silks.

The potential climatic range of the silkworm is wide, but as development from egg to cocoon occurs in the spring of the year and takes only about seven weeks, the yield is somewhat dependent on the weather. The temperature should never be less than 60°F. during April, when rearing generally begins, and for this reason silk is a product of the warm temperate regions. Moreover, the production of real silk requires a very large and cheap labour supply as well as a certain skill and delicacy which are acquired only after several generations, so that the productive area for silk is practically restricted to the closely populated monsoon countries of Asia and to certain countries of Southern Europe (*e.g.*, Italy) where the processes have been perfected.

Production and Trade

About 85 per cent. of the world output of raw silk is produced in *China* and *Japan*. China (between lat. 30° and 35°N. and in Kwangtung) produces more silk than any other country. Japan, second in order of production, yields only one-tenth the number of lbs. of cocoons obtained in China, but is far ahead of China in raw silk exports, in spite of greater fluctuations in the yield owing to the colder weather in spring. This is explained by the fact that Japan is a great collecting centre for raw silk, and that she markets a large quantity which is actually produced elsewhere. *India* produces silk but exports little, and *Indo-China*, *Persia*, *Syria*, *Asia Minor* and *Transcaucasia* also are producers. Europe produces 14 per cent. of the world supply and of this Italy's share is 85 per cent., *i.e.*, about 12 per cent. of the world production. In that country the industry is centred in the Plain of Lombardy. In *France*, which produces about 7 per cent. of European silk, the centre is in the Rhône Valley.

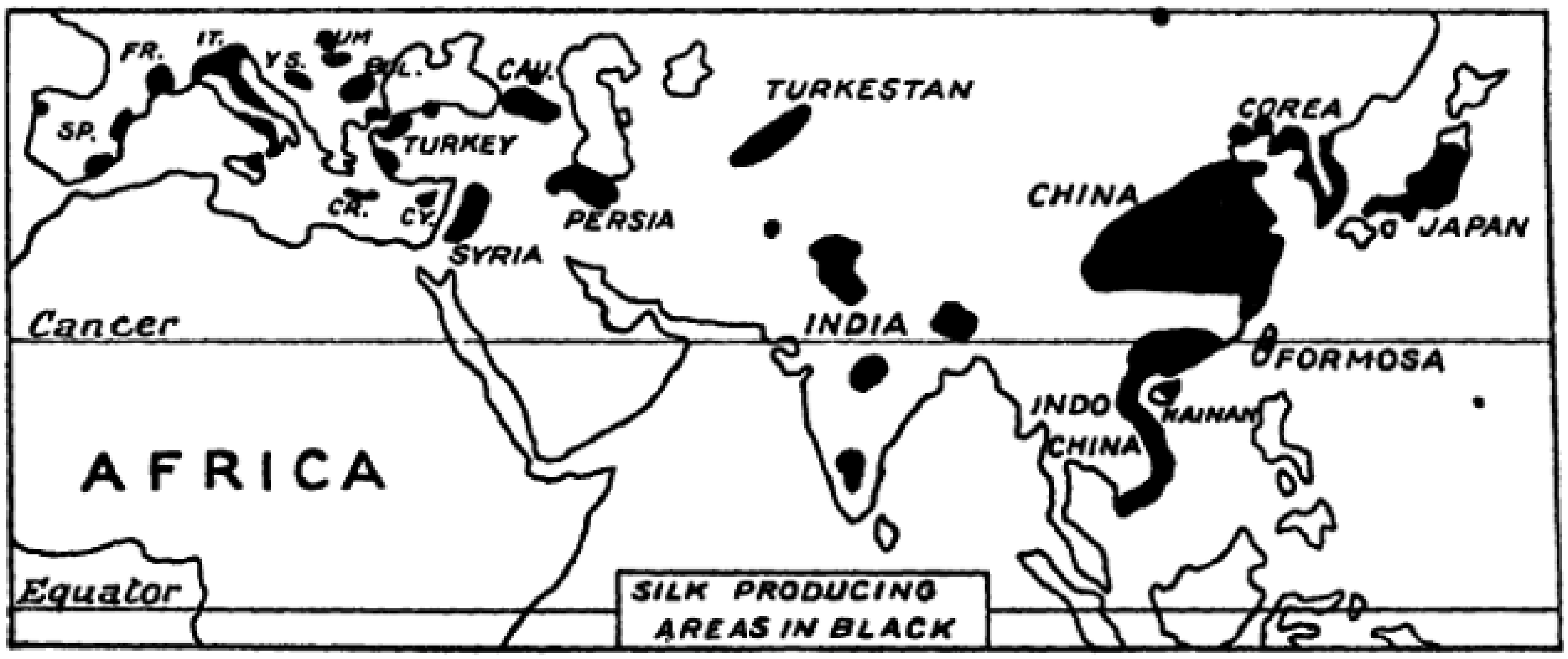


FIG. 93: WORLD DISTRIBUTION OF SILK.

Sp.=Spain; Fr.=France; It.=Italy; Y.S.=Yugoslavia; Rum.=Rumania; Bul.=Bulgaria; Cau.=Caucasus; Cr.=Crete; Cy.=Cyprus.

In 1932, out of a total world export of 40,000 metric tons of raw silk, Japan exported 33,000 metric tons. China exported 4,000 metric tons and Italy 2,700 metric tons. Over 75 per cent. of the Japanese output goes to the United States, and a little to France and Canada. In 1932 the United States imported 32,000 metric tons. In that country an enormous silk industry has been established at Paterson (N.J.), and to-day this absorbs over two-thirds of the world's supply of raw silk. Though climatic and other conditions are favourable,(the production of raw silk in the United States is prevented by the lack of cheap, skilled labour.) Other importers are France, India, Canada, Great Britain and Germany. Italy exports to France and imports from Japan, the exports being larger than the imports.

HIDES AND SKINS

Hides and skins are obtained from a great number of animals and are used for the purpose of making leather. Both hides and skins are derived from the larger mammals, such as oxen, sheep, horses, goats and pigs, whilst skins are obtained also from smaller mammals, and even from reptiles and fish. Crocodile, python, lizard and shark skins are made into leather, while the hide of the Beluga or white whale is made into the so-called " Porpoise Leather ", a tough waterproof leather used for shooting-boots.

All the large cattle-rearing regions produce hides in quantity. *India*, the leading exporter, formerly supplied most of the British imports, but now that India has begun to import leather, *Argentina* and *Italy* export more hides to Britain. *Brazil* is second to India as an exporter of hides. The leading importers of hides are the United States, Germany and Britain. *India, S. Africa* and the *Mediterranean lands* export goat skins ; *Australia, New Zealand* and *Argentina* export sheep skins. *Europe* provides horse hides, whilst the *United States* and *China* export pig skins, which are used largely for harness and for fancy leather goods.

FURS

Furs are obtained mainly from the colder regions of *North America* and *Asia*. The rabbit and the seal provide most of the fur in commercial use, while squirrels, hares, cats, musk rats and coypus (South American beavers) supply over a million skins each year. The most valuable furs are seal, sable, stoat, ermine, otter, silver fox and beaver, but rabbit skins are frequently dyed and made up to imitate the more valuable furs.

The skins are collected and marketed at a few great centres where traders obtain their requirements of their own special lines. Canadian furs, including the Pribilov sealskins from the Behring Sea, are marketed chiefly in London and to a smaller extent in New York. Siberian and Russian skins are collected at Irbit (100 miles N.E. of Ekaterinburg), Gorky and Leipzig. The last-named town is the greatest fur marketing centre in the world, largely because it is situated in the middle of a populous fur-wearing district.

FEATHERS

Feathers are classed commercially as "ornamental" and "bed" feathers. British imports of feathers include both types. *France* is the leading country trading in ornamental feathers, being followed by *Holland*, *Austria*, *Germany* and the *United States*. Egret or osprey plumes are the white dorsal feathers of types of egrets and come from *Australia*, *Japan*, *N. Africa*, the *Levant* and *tropical America*. Marabou feathers are from the tail of the adjutant stork and other storks of *India*, *N. Africa* and *E. Asia*. Humming birds, birds of paradise, parrots, gulls, eagles and blackcock all supply highly valued plumes. Bed feathers are supplied by geese, ducks, turkeys, partridges and similar birds, and are imported from many parts of the world. The warmest and finest quality is eider down, obtained from the nesting places of the eider duck, which inhabits the lonely islands off the coast of *N. Norway* and *Lapland*.

China and the *United States* produce three-quarters of the world's supply of feathers. Ornamental feathers, being articles of fashion, are subject to remarkable fluctuations in supply and demand from year to year. This is nowhere more strikingly illustrated than in the case of ostrich feathers which, at one time the proud possession of every woman who could afford them, are nowadays rarely worn. Hence, the export of these feathers from South Africa has declined considerably since 1913, when the value sent overseas totalled £2,000,000 as against only £22,000 in 1932.

QUESTIONS

See end of Chapter 11.

CHAPTER 11

MAN'S FOOD SUPPLY

FOOD is obtained from both the animal and vegetable kingdoms. The former provides meat, fish and dairy produce. The latter supplies cereals (wheat, barley, oats, rye, maize, rice and millet); other food crops (potatoes, sugar, pulses, sago, tapioca, arrowroot, spices and condiments); the beverage crops (tea, coffee, cocoa, hops and grapes); fruits in great variety; and finally vegetable oils of various kinds.

The most important of all foods are the cereals, on which the greater part of the world's population relies as the basis of its food, the only exceptions (estimated at about 1 per cent. of the total population) being small and primitive races living in difficult climatic regions.

Climatically, the vegetable foodstuffs can be divided into :—

TEMPERATE PRODUCTS—wheat, barley, oats, rye, potatoes, sugar-beet, hops and many fruits.

SUB-TROPICAL PRODUCTS—maize, wheat (as a winter crop), olives and fruits.

TROPICAL PRODUCTS—rice, sugar-cane, tea, coffee, cocoa, fruits and various vegetable oils.

The animal products—meat and dairy produce—are mainly temperate zone products, though they are not confined entirely to this zone.

ANIMAL FOODSTUFFS

BEEF

Cattle, from which beef is obtained, can be reared in a variety of conditions. Indeed, they will flourish anywhere except in dense forests, deserts and very hilly country, and, apart from being reared in order to provide meat, they are used for a variety of purposes, dependent upon the geographical conditions. In India, Africa, China and Japan, for instance, the animals are used mainly as beasts of burden, and, largely as a result, they produce poor beef and give but a low yield of milk.

The following Table shows the number of cattle in the leading countries in 1913 and in 1932 :—

Number of Cattle in Principal Countries

	1913	1932
	(in millions).	
India	132	160
U.S.S.R.	60	41
U.S.A.	59	64
Brazil	31	43
Argentina	26	32
Germany	18	19
France	15	15
Australia	11	12
Poland	9	9
Uruguay	8	7
U.K.	8	8
Canada	7	8
South Africa ...	6	10

There are notable differences in the conditions which determine whether cattle are reared for beef or whether they are utilised for dairy purposes. Beef cattle are more hardy, and may be bred on stretches of land where the grass is relatively poor, provided they have plenty of space. Dairy cattle flourish in an equable climate, where temperature and rainfall are such as to provide rich, luscious grass. Moreover, if milk is to be sold fresh it must be produced near its market, and milk cattle require more labour and attention than beef cattle. It is possible, however, to keep both kinds profitably in some regions, as in Great Britain.

The best beef cattle are produced in Europe, but it is quite impossible for European countries to supply the quantity of beef necessary to feed their dense populations. Consequently, large imports of beef are obtained from overseas, and thus have arisen the great exporting industries of the grasslands of Argentina, Australia and other "newer" countries. The quality of the stocks in these countries is kept at a high standard by the constant importation of the best pedigree beasts from Europe, especially from Britain and France.

The trade in beef was at one time confined to the export of live cattle or of jerked and salted beef. Canned meat and meat extracts followed, but the great landmark in the trade was the discovery of processes for freezing and chilling beef. The first successful cargoes of frozen meat were sent from Argentina in 1878 and from Australia in 1879. By 1880 most steamships engaged in the North American meat trade were fitted with refrigerators.

"Chilled" beef differs from "frozen" beef in the temperature at which it is kept during transport. The former is transported in cold storage chambers at a temperature of 30°F., just low enough to prevent decomposition. The latter is frozen hard at a temperature of 10°–15°F. and is so kept until it is finally sold to the consumer. Provided the distance over which the meat must be transported is not too great, chilled beef is superior to frozen beef because it suffers no deterioration in quality, whereas the freezing and thawing processes lower the quality. As the Argentine is nearer the European market than Australia, for example, its beef can be chilled and marketed in better condition than Australia's frozen product, and, as a result, the Argentine has become the principal beef-exporting country in the world.

Principal Beef-Producing Countries

South America easily leads the world in beef production. The cattle-rearing areas are the temperate grasslands of the La Plata estuary and the lower Parana basin. A large part of *Uruguay* is devoted to cattle-rearing, whilst further north the area extends into *Brazil* (Matto Grosso). Brazilian cattle, however, are of poor quality. As we have seen, the application of the chilling process has enabled the *Argentine* to export more beef than any other country in the world and to furnish over 70 per cent. of the world's total exports.

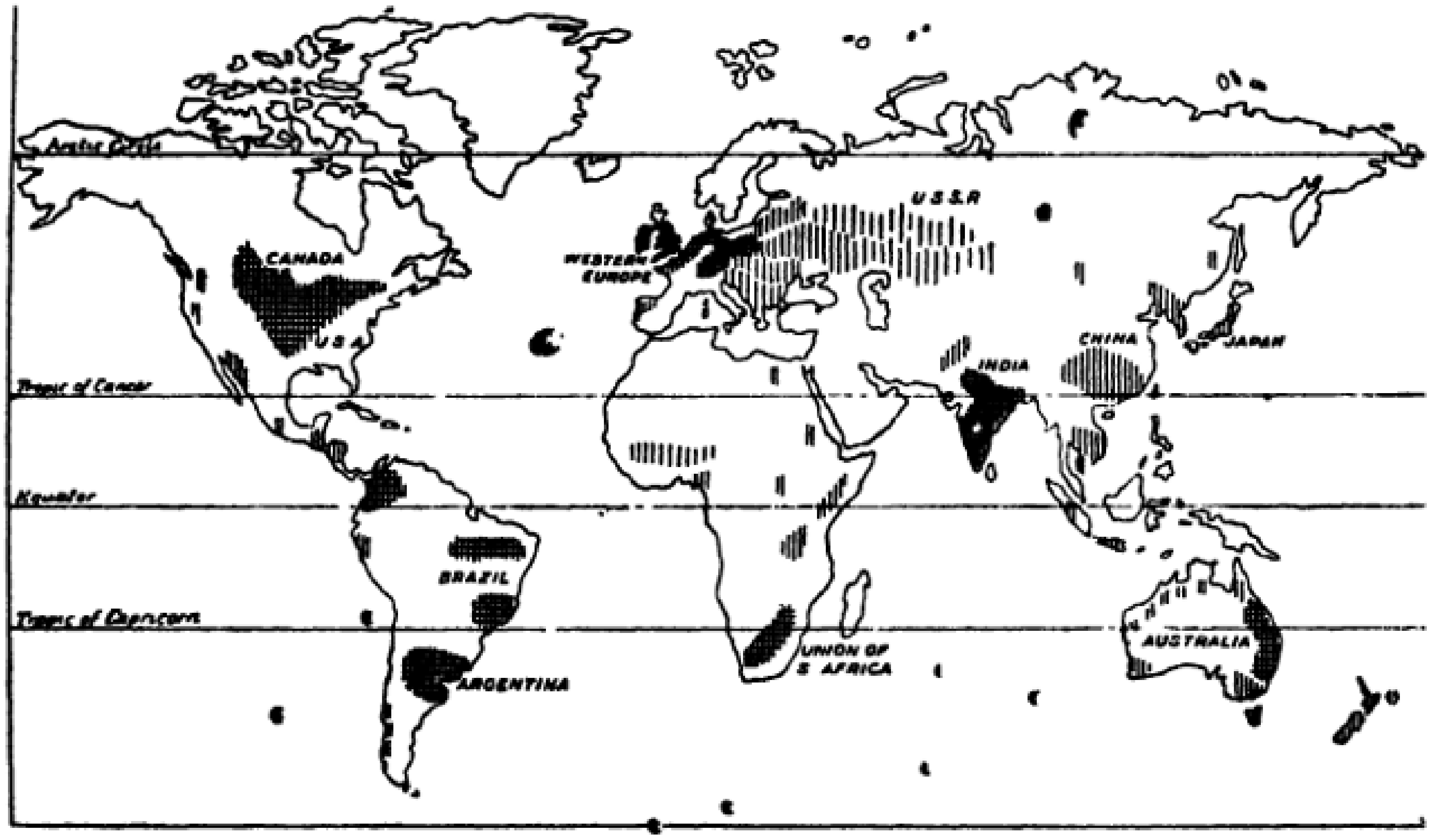


Fig. 94 : World Distribution of Cattle.

North America. Here there are two principal areas: (*a*) the drier western prairies, where the water supply is insufficient for agriculture, and (*b*) a region focussed on Chicago, rather to the north-west of the maize belt.

Australia. The tropical grasslands of *Queensland* and *North Australia* are the principal beef-producing areas.

Europe. In most European countries, both beef and dairy cattle are reared, the dairy animals more particularly in north-western Europe. *Denmark*, the *Netherlands*, *Switzerland*, the *Baltic States*, *Spain*, *Portugal*, *Italy*, *Great Britain*, *France*, *Germany*, *Central Europe* and *Russia* all produce beef cattle.

Commerce in Beef

The Table below shows the trade in beef of certain countries for the years 1909–13, 1925–29 and 1932. The figures include in some cases a certain quantity of mutton, pork and hams, but this does not materially affect the position.

Commerce in Beef

AVERAGE PER YEAR IN THOUSANDS OF METRIC TONS

Exports					*Imports*				
1909–13			'25–29	1932	1909–13			'25–29	1932
Argentina	319	Argentina	684	451	U.K.	403	U.K.	622	570
Australia	75	Uruguay	140	89	Germany	24	Germany	125	3
Uruguay	68	Australia	89	67	Brazil	24	Italy	67	33
U.S.A.	21	Brazil	39	43	Cuba	17	Belgium	37	25
N.Z.	19	N.Z.	28	27	U.S.S.R.	9	U.S.A.	32	7
China	12	Chile	18	15	Switzerland	8	Austria	23	6
		Canada	17	2	Belgium	8	Japan	17	11

The Argentine is still the leading exporter and has increased her exports considerably since 1913. The United Kingdom receives about 85 per cent. of the Argentine beef exports, continental Europe takes about 14 per cent. and the United States 1 per cent. Uruguay also has increased her exports; her chief customers are the United States, Germany and France. Brazil and Canada appear as exporters in 1925–29, whereas in 1909–13 they were importers. Brazil exports to continental Europe and Canada to the United Kingdom. The United States, on the other hand, now find it necessary to import. Over 50 per cent. of the Australian exports are sent to the United Kingdom, the remainder going to the Empire countries (13 per cent.), Belgium (15 per cent.), Germany, the Philippines, Japan and Egypt. New Zealand exports beef to the Pacific Islands and the United Kingdom. China's exports have slightly increased in recent years, but their proportion of the world's trade is relatively less important than it used to be. Imports into Italy increased from 5,700 metric tons in 1909–13 to 67,000 in 1925–29 (44,000 in 1932). The figures for the U.S.S.R. are stationary at 9,000. Japan was almost self-supporting in pre-war days, and the imports into Switzerland are now relatively small. Chile exports the bulk of her supplies to the United States. France was self-supporting in 1913, but she now imports amounts varying between 10,000–60,000 metric tons per annum. The notable decline in imports into Germany will be apparent also in the cases of other farm products, and is a result of the recent adoption of a policy of self-sufficiency in foodstuffs.

DAIRY PRODUCE

The commerce in dairy produce is somewhat restricted, and only a few countries are concerned in the export trade. Most countries in the temperate zone are able to furnish their own supplies, but in Western Europe the trade in dairy produce is of outstanding importance, and has been considerably assisted by the adoption of co-operative methods of marketing and by Government grading of the various products.

Milk

Milk cannot be transported *fresh* over long distances, although refrigeration has made possible a considerable trade in fresh milk. Such trade, however, requires expensive machinery and a high degree of organising efficiency. *Condensed* milk will bear the cost of transport by any means and over any distance, and there is consequently a world-wide trade in this product. *Powdered* milk also will bear transport by all ordinary means and will keep for long periods. Consequently, it finds its way into the most remote parts of the world.

The chief milk-exporting countries are shown in the Table below, which reveals also the great change in the direction of the milk trade since the War. Hungary's post-war export trade is insignificant in comparison with her pre-war export. Australia and New Zealand imported a little before the War, but they now have an increasing export.

Exports of Milk

AVERAGE PER YEAR IN THOUSANDS OF METRIC TONS

	1909–13		1925–29	1932
Hungary	68	Netherlands	164	190
Switzerland	41	Canada	52	11
Denmark	27	Switzerland	38	14
Norway	17	Denmark	26	27
Finland	11	U.S.A.	20	27
U.S.A.	7	Norway	12	5
France	7	Australia	10	14
Canada	7			

Imports of Milk

AVERAGE PER YEAR IN THOUSANDS OF METRIC TONS

	1909–13		1925–29	1932
Germany	55	U.K.	136	160
U.K.	36	Germany	40	2
Cuba	14	Cuba	20	8
Austria	12	N.E.I.	15	13
South Africa	9	Philippines	15	14
India	5	India	9	9
		China	5	4

Butter

The manufacture of butter is tending to become more and more specialised. If a reputation is to be established and maintained, both the quality and the amount of the output must be kept at a high level.

The butter-producing countries therefore supply decreasing quantities of milk and cheese, whilst the milk-exporting countries do not sell much butter. The butter production of the exporting countries is mainly sent to Great Britain. Denmark and the Netherlands, with the advantage of proximity, and Australia and New Zealand, as members of the Empire Commonwealth, have the largest share in the trade with this country.

The post-war change in the position of the various exporting countries is shown in the Table below, whence it will be seen that Great Britain takes over 50 per cent. of the total butter export of the world. The position of Russia in the export trade is worthy of notice. France, from being a leading exporter of butter in 1909–13, has become an importer, whilst Australia has markedly increased her production and export, particularly during 1931 and 1932. The countries bordering the Baltic (Sweden, Finland, Estonia, Latvia and Lithuania) have *collectively* a large export of butter, amounting to 70,000 metric tons in 1932. The appearance of the Irish Free State and the Argentine in the export Table is worthy of note. Sweden still has an export surplus.

Commerce in Butter

AVERAGE PER YEAR IN THOUSANDS OF METRIC TONS.

Exports					*Imports*				
1909–13			'25–29	1932	1909–13			'25–29	1932
Denmark	86	Denmark	140	157	U.K.	206	U.K.	293	413
U.S.S.R.	67	N.Z.	71	111	Germany	50	Germany	112	69
Australia	35	Australia	44	104	Switzerland	5	Switzerland	8	4
Netherlands	32	Netherlands	43	16	Belgium	5	N.E.I.	5	6
Sweden	20	U.S.S.R.	28	31	N.E.I.	2	France	4	8
N.Z.	18	I.F.S.	24	16			Belgium	1	20
France	14	Argentina	23	25					

Cheese

In the matter of production and trade, cheese bears some similarity to wine, for, as in the case of wine, its production is somewhat localised, each well-known variety being associated with some definite place, and the newer countries are now producing cheeses of similar character to the well-known varieties of older countries. As will be seen from the Table appended, there has been a considerable change in the order of importance of the cheese-exporting countries since pre-war years.

Commerce in Cheese

AVERAGE PER YEAR IN THOUSANDS OF METRIC TONS

Exports					*Imports*				
1909–13			'25–29	1932	1900–13			'25–29	1932
Canada	75	Netherlands	89	77	U.K.	116	U.K.	147	149
Netherlands	57	N.Z.	78	91	Germany	21	Germany	66	47
Switzerland	29	Canada	53	39	U.S.A.	18	U.S.A.	33	24
N.Z.	25	Italy	30	26	Belgium	14	Belgium	17	20
Italy	21	Switzerland	27	18	France	8	France	2	10

Poultry and Eggs

POULTRY are reared in almost every part of the world and are used for food in the countries where they are reared. A certain amount of trade exists in poultry and game, but it is mostly between neighbouring countries and so far has achieved little international importance.

EGGS, mainly the produce of the domestic fowl, enter rather more largely into commerce. Where distances are not too great, the eggs are exported fresh, but when they are sent, say, from China to Europe, they are preserved or dried.

The leading exporting countries are Denmark, the Netherlands, Poland, Belgium, the Irish Free State, China, Turkey and Egypt. The United Kingdom is the chief importer, followed by Germany and Italy.

Eggs are used not only for food, but also for other important purposes, as in book-binding and the manufacture of fancy leathers. The white of eggs is used as a clarifying agent in wine manufacture and in sugar-refining, and is an ingredient in the emulsion of photographic paper. China has the largest export trade in egg products; the leading importers are the United Kingdom and Germany.

MUTTON AND PIG-PRODUCTS

Mutton

Sheep can be reared either for their mutton or for their wool and to a restricted extent, mainly in Southern Europe, for their milk from which cheese is made, *e.g.*, Roquefort cheese. If reared for meat, they require a damper climate and richer pasture than the wool-producing sheep. Hence, meat-producing sheep are essentially animals of the cool temperate lands such as Great Britain and New Zealand. The less reliable rainfall of Australia causes the sheep to be reared rather for wool than for mutton, whilst the fact that mutton does not suffer in quality when frozen enables New Zealand to compete successfully in the European market with countries such as Argentina and Uruguay.

The trade in mutton is noteworthy for a large export from New Zealand, the Argentine and Australia, and a large import to the United Kingdom. For the years 1909–13, New Zealand exported an average of 105,000 metric tons of mutton per year, and for the years 1928–32, an average of 160,000 metric tons. The respective figures for the Argentine were 69,000 and 78,000 and for Australia 69,000 and 54,000. Uruguay now exports about 20,000 metric tons yearly. Imports into the United Kingdom averaged 268,000 metric tons for the years 1909–13, and 320,000 metric tons for the years 1928–32.

Pig-Products

Pigs are reared in many parts of the world, for they are not restricted by any climatic requirements. Indeed, one of the most important determining factors in pig-production is the influence of religion—no pigs are to be found in Mohammedan countries, for example. The principal pig-rearing areas are China, North-west Europe, Central Europe and the United States. To a slightly smaller extent pigs are reared in Brazil and the Philippines. Thanks to the existence of the great maize-belt, which supplies an abundance of cheap food, the United States control most of the world trade in pig-products, and its meat-packing industry is the second most important industry in value in the country. Denmark, the United States, the Netherlands, Canada and Ireland export *bacon*; the United States, the Netherlands, Poland, Sweden, Argentina and the Irish Free State export *pork*; Germany, China and Russia export *pig's bristles* (a valuable by-product and not, of course, a food-stuff); and the United States have an almost complete monopoly of *lard* exports.

FISH AND FISH PRODUCTS

Fish forms one of the most important foodstuffs of the human race, especially of those peoples who live in the temperate zone. (Since fish need for their food an abundance of animal and vegetable organisms, which, owing to their dependence on light for their existence, are restricted to shallow waters, the best fishing grounds of the world are found on the continental shelves of Europe and of America. and in shallow seas such as the Sea of Japan.)

Leading Fisheries of the World

The principal fishing areas are :—

1. The continental shelf and coasts of Western and North-Western Europe;
2. The chain of submerged plateaus extending along the eastern coast of Canada, Labrador, Newfoundland and the New England States;
3. The coasts of Japan; and
4. The coastal river fisheries of western North America from Oregon to Alaska.

It is interesting to note the similarities in the geographical setting of the world's three main sea fishing areas—(1), (2) and (3) above. They all lie in temperate latitudes, are situated on the edge of continental shelves or in shallow seas, and are influenced by cool and warm ocean currents or drifts. These facts are brought out in Figs. 95, 96 and 97.

European Fisheries. The *British* catch of fish exceeds 1,000,000 tons per annum, and in normal times the amount fluctuates very little. In 1933 the total catch was valued at about £15 millions (excluding shell-fish). The fish caught are mainly herring, cod and haddock, but these are not all obtained from the seas immediately round Britain; large quantities are caught in areas as far away as the Barents Sea, the White Sea and the coast of Morocco. English waters provide a greater variety of fish than Scottish waters, the most important kinds being herrings and mackerel amongst surface fish; and soles, haddock, cod and turbot amongst bottom fish. In Scotland herrings are the most common, with haddock and cod next. Hake and plaice are also important in English waters, while pilchards are caught off the Cornish coasts. (See also Chapter 24.)

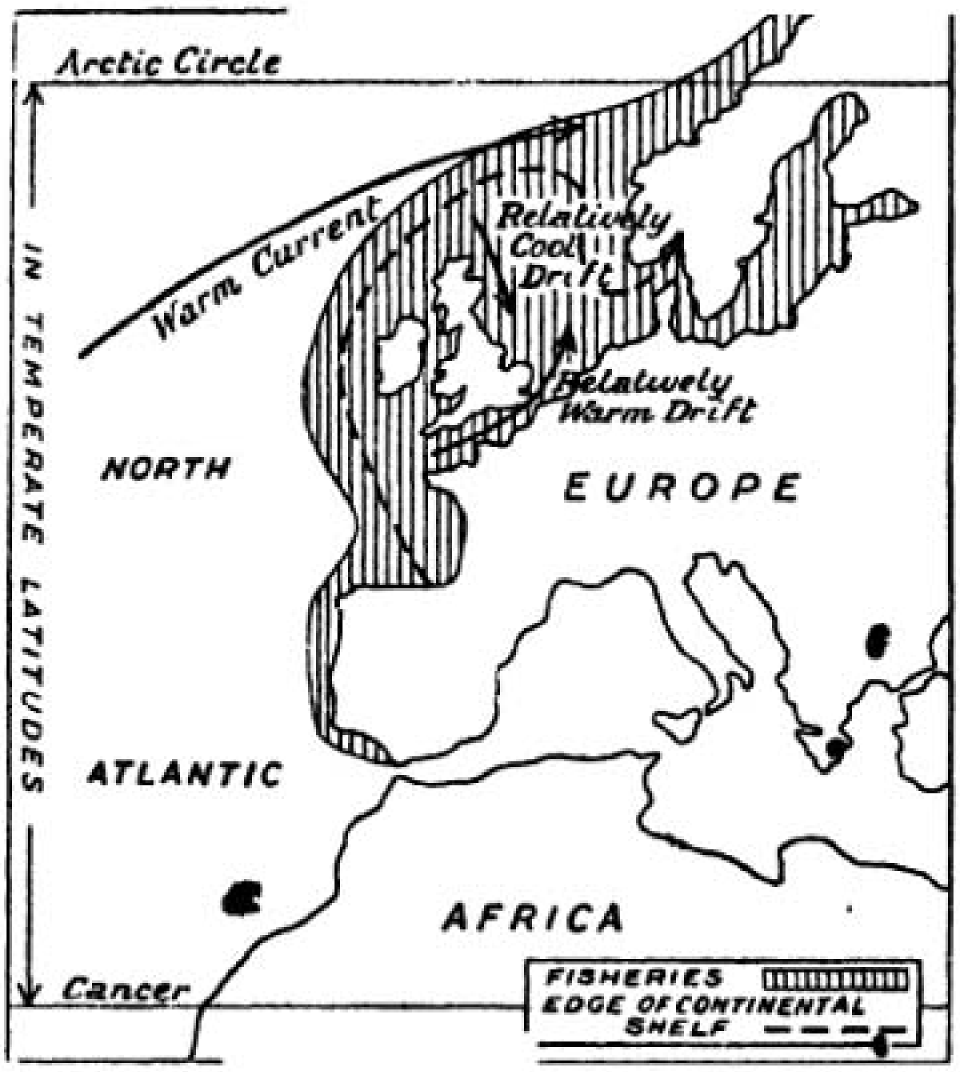


FIG. 95: EUROPEAN FISHING AREA.

The leading British ports engaged in the industry are Grimsby, Aberdeen, Hull, Yarmouth, Lowestoft and Fleetwood—all, except Fleetwood, being North Sea ports. This is because the waters of the North Sea are much richer in fish than the western waters. The great British market for fish is Billingsgate in London, through which about 40 per cent. of the British catch is marketed.

The *Norwegian* fisheries are mainly cod and herring, the shallow banks round the Lofoden Islands being the centre of the cod fisheries, whilst herrings are caught off Bergen. The Norwegian whale, walrus, seal and shark fisheries are also important, though not so much for the food they supply as for other valuable products. Fish and fish-products comprise about 25 per cent. of Norway's total export values.

France, *Spain*, *Portugal* and *Italy* confine their attention mainly to the sardine and anchovy, which are caught in vast numbers along the Mediterranean coasts. The great sardine-packing centres are Beaucaire on the Rhône (Provence), Bordeaux and Le Mans. The only other fish of importance in the Mediterranean are sprats and tunny. The tunny is a large fish of the mackerel family, which is frequently as much as twelve or thirteen feet in length, and of some 1,000 or 1,200 lbs. weight.

The *Baltic* fisheries are unimportant owing to the comparative freshness of the water.

In *Russia*, the river fisheries (especially of the Volga) are important owing to the abundance of sturgeon, which yields caviare and isinglass.

THE NORTH AMERICAN ATLANTIC FISHERIES are the most valuable in the world, and have been important since the early part of the sixteenth century. They are situated around the coasts of Newfoundland (with Labrador), Canada (Nova Scotia, New Brunswick, Prince Edward Island and Quebec), the United States and the two small French islands of St. Pierre and Miquélon. The open sea fisheries are free to all peoples, but the inshore rights are regulated by treaty. The principal fish caught are cod, haddock, herring, hake, mackerel and halibut, whilst the most extensive lobster fishery in the world lies along the eastern shore of Canada. Oysters are abundant in the quiet creeks of Chesapeake Bay (U.S.A.), with Baltimore as the commercial centre.

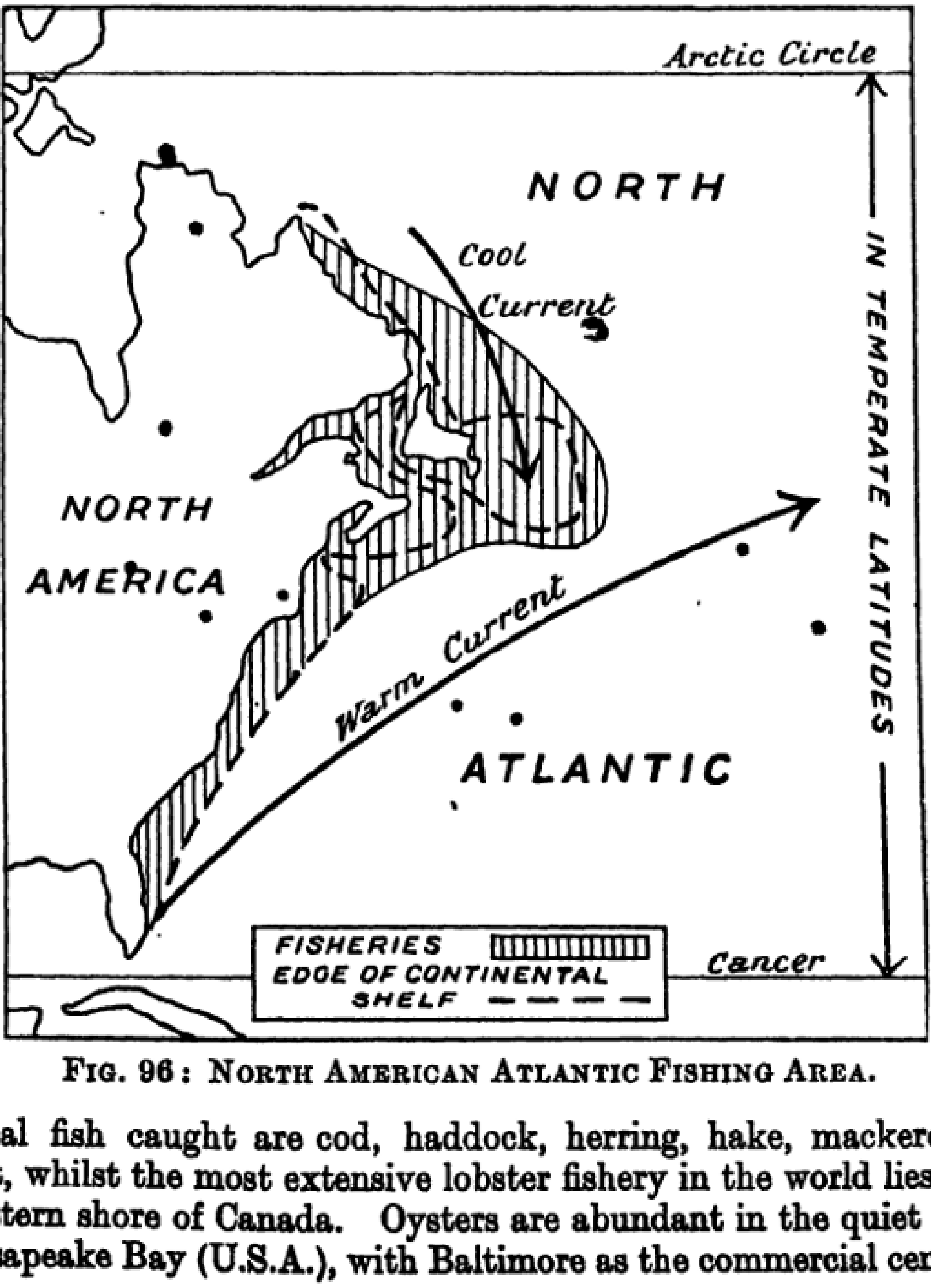


FIG. 96: NORTH AMERICAN ATLANTIC FISHING AREA.

The North American Pacific Fisheries yield an enormous quantity of salmon, which are caught chiefly in the numerous rivers and estuaries of Alaska, British Columbia, Washington and Oregon. Throughout the region a great salmon-canning industry flourishes and sends its exports to every part of the world. The sea fish of this region include halibut and herring.

The Lake Fisheries of North America are of great importance, the principal fish taken being whitefish and sturgeon.

The Japanese Fisheries yield important quantities of sardines, herrings, bonitos, cod, salmon, tunny, mackerel and sole. The Japanese are large fish eaters and fishing in that country is an important industry, employing about one million people.

Many of the Japanese catches are of small fish which are not eaten but are spread over the land as manure, for, as a result of the universal dearth of animals in that country, farmyard manure is scarce.

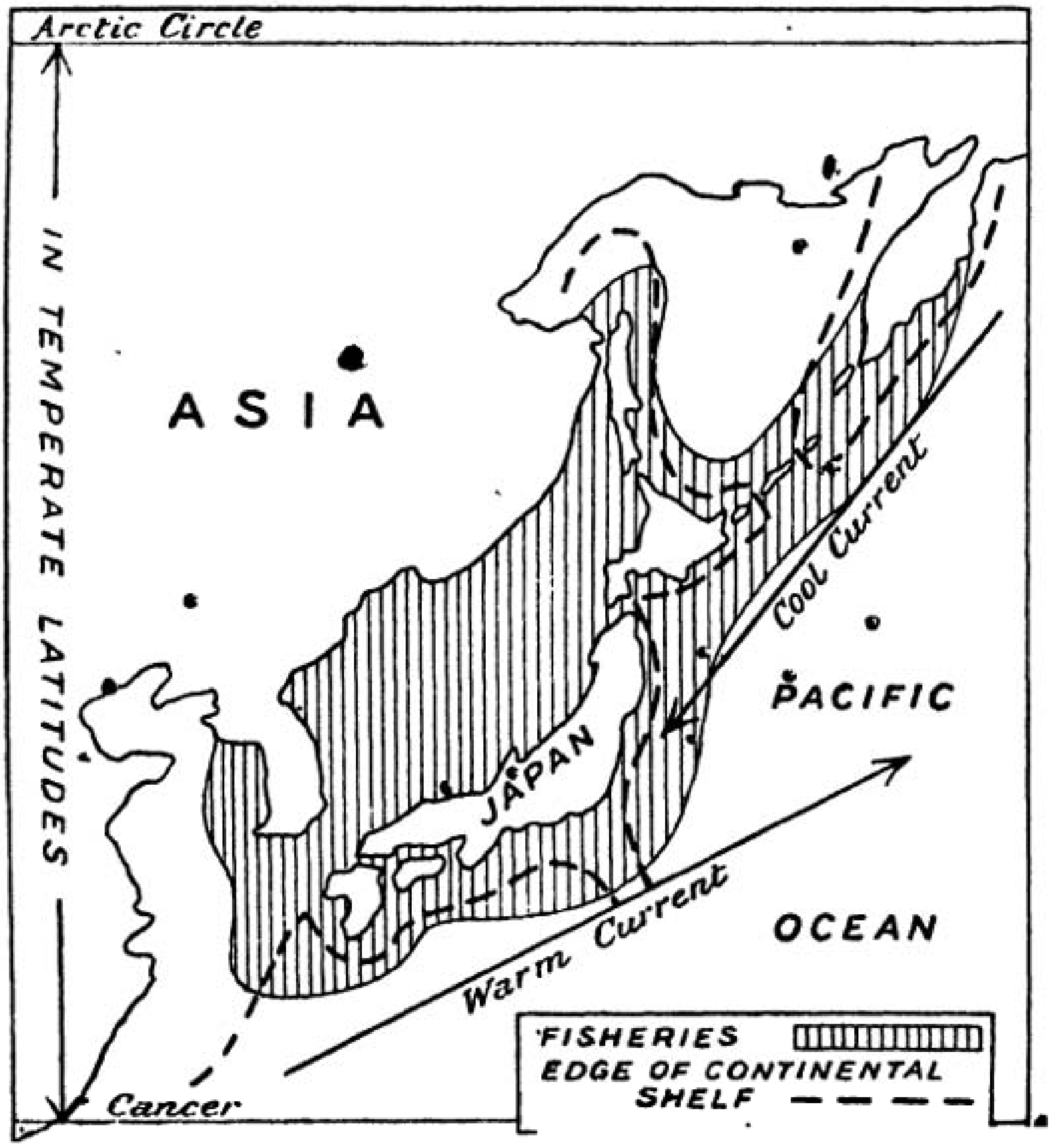


Fig. 97 : Japanese Fishing Area.

In the *East Indies, New Guinea* and *Northern Australia*, the catching of trepang (bêche-de-mer), which is a favourite article of food in China, is an important industry, whilst the *Union of South Africa, Australia* and *New Zealand* have fishing industries of considerable importance.

Commerce in Fish

Most of the fish caught is used as food in the countries where it is landed, and consequently fish does not enter greatly into world commerce. British exports of herrings to Germany and Russia are balanced by imports of canned salmon from America and sardines from France. More than half the Canadian catch is sent to the United States. Newfoundland and Norway both export the greater part of their produce. St. John's in Newfoundland and Bergen in Norway send dried and cured cod to Spain, Portugal and Italy, while Norway sends dried herrings to the Baltic States. The refrigeration of fish has developed to a certain extent of late years, but this section of the trade is as yet in its infancy. Rhodesia is regularly supplied with fish sent frozen from Cape Town.

CEREALS

The most important cereals are wheat, rye, barley, oats, maize and rice. Wheat has the largest acreage sown and the smallest yield per acre, whilst wheat and maize have the largest production and export. The relative importance of the crops in area sown, production, yield and net exports is shown in the following Table.

Relative Importance of the Cereals

	AREA (*Mill. Acres*)		PRODUCTION (*Mill. Metric Tons*)		YIELD (*Metric Ton per Acre*)		TOTAL EXPORTS (*Mill. Metric Tons*)	
	1909–13	1932	1909–13	1932	1909–13	1932	1909–13	1932
Wheat	270	345	103	125	·36	·33	16·7[1]	18·5[1]
Rye	100	111	45	48	·45	·43	1·39[2]	1·2[2]
Barley	85	103	38	41	·45	·40	5·2	2·5
Oats	143	141	65	64	·45	·45	2·3	1·2
Maize	177	215	106	124	·60	·57	6·3	10·5
Rice	120	141	78	87	·65	·62	4·5	6·9

[1] Including wheat flour. [2] Including rye flour.

WHEAT

Wheat is the most important food product used by man. It has been cultivated since Neolithic times, and by continual care, cross-breeding and selection, species have been produced which will grow as far north as the Arctic circle. It is a grass of the genus *triticum*, but so many different varieties exist that wheat of one kind or of another will flourish in regions so distinctive from the standpoint of climate as Western Europe, the Mediterranean lands, and tropical countries such as India. Naturally, each of the different varieties requires its own special conditions of growth, and English wheat seeds, for example, will not flourish in India.

Climate is the most important factor in wheat cultivation. If a good crop is to be obtained, the seed must germinate in the cool, moist part of the year, since more stalks, and therefore more heads, are produced when the plant's growth is comparatively slow. The growing season must be at least 90 days long. For ripening, wheat requires a warm, dry season with a temperature not lower than 60°F. The conditions prevailing during the ripening season determine the quality and colour of the grain. The American variety is "red", the Australian "white" and that of Mediterranean and monsoon regions is "hard".

The best soils for wheat production are those in which clay predominates, but too stiff a soil is not advantageous. Good drainage is important, but the ground must be sufficiently level to permit the use of machinery, otherwise the cost of labour is unduly increased, whilst level land also facilitates transport.

The interior temperate grasslands of the world most nearly fulfil the ideal conditions for wheat production. The soils of these areas have in many cases the additional advantage of containing a considerable amount of organic matter, as, for example, the famous black soils of the prairies and of the south of Russia, whilst the light spring rainfall and the melting of the snows in the spring are other advantageous factors.

The prairies of North America have from 15 to 35 inches of rain per annum, mostly in spring and early summer, though the evaporation ratio is a more important indication of suitability than is actual rainfall. The best wheatlands of North America lie within the 60 per cent. evaporation ratio belt. In drier parts the wheat is cultivated by dry farming.

A limit is set to the territorial spread of wheat culture in North America and other warm lands by the tendency of the grain to be attacked by a disease called "rust" wherever the rainfall in the cropping season is in excess of the normal for the crop. Much thought and effort have been expended in recent years in the United States to combat this disease—in particular with a view to tracing the winter "host" of the "rust" bacteria. This has now been proved to be the "barbary" bush, so that in future it is likely that the foregoing disadvantage will be overcome when war is waged against this offending plant in the interests of the wheat farmers.

In those climates where the winter is so cold that vegetation lies dormant, there are two distinct classes of wheat—"winter" wheat and "spring" wheat. Winter wheat is sown in the autumn and reaped about the middle of the following summer. It is grown only in those areas where the winter is not too severe or where a reliable snowfall occurs to protect the seed with a covering of non-conducting snow. England and certain parts of Canada and the United States grow winter wheat. Spring wheat is sown in the spring and is harvested about a month later than the winter wheat. In tropical countries, such as India, the seed is sown towards the close of the rainy season, and is harvested just before the hottest part of the dry season sets in.

In the Southern Hemisphere, wheat is harvested mainly in January; Indian wheat is harvested in February and March; Egyptian wheat, in March and April; the wheat of North Africa, China and Japan in May; Mediterranean wheat and the "winter" wheat of the United States in

June; the wheat of southern Russia, northern United States and eastern Canada in July; western Europe and Canadian "prairie" wheat in August and September; the wheat of northern Russia in October; of South Africa in November; and of South Australia in December. Hence, it is clear that wheat is available throughout the year.

The older wheat-producing countries, such as those of Western Europe, grow wheat mainly for home consumption. Indeed, England has been compelled to import wheat since the early part of the nineteenth century, when industry entered on its period of great development.

Principal Wheat-Producing Regions

The production of wheat in the principal countries is shown in the Table below. World production for the years 1909–13 averaged 103 million metric tons and for the years 1928–32, 104 million metric tons. The yield per acre varies considerably. Generally speaking, the yield of the "old" countries of dense populations is higher than that of the "new" countries of sparser populations. Thus, Belgium, Denmark, Germany, the United Kingdom, the Irish Free State, the Netherlands, Sweden and Switzerland all have an average yield of more than 30 bushels per acre. In Canada, the United States and the Argentine, however, the average yield is only about 18, 14 and 13 bushels per acre respectively. These differences are a result of the more intensive methods of cultivation practised in the densely populated lands, where it pays the farmer to apply a high proportion of labour and capital to the development of his land.

Production of Wheat[1]

AVERAGE PER YEAR IN MILLIONS OF METRIC TONS

	1909–13		'25–29	1932
U.S.S.R.	20·6	U.S.A.	22·3	20·2
U.S.A.	18·8	U.S.S.R.	21·6	20·2
India	9·6	Canada	11·7	12·1
France	8·9	India	8·7	9·2
Canada	5·4	France	7·8	9·1
Italy	5·0	Argentina	6·3	6·4
Argentina	4·0	Italy	6·2	7·5
Germany	3·8	Spain	4.0	5·0
Spain	3·6	Australia	3·7	5·8
Australia	2·5	Germany	3·2	5·0
Rumania	2·4	Rumania	2·8	1·5
		Turkey	1·7	1·9

NORTH AMERICA. The principal wheat lands of North America are the Winnipeg basin and the neighbouring lands of the United States. There are three different producing areas: (1) the spring wheat area north-west and west of the Great Lakes; (2) the winter wheat area south-west of the Great Lakes; (3) the dry farming area of the far west and south-west of the United States.

---

[1] According to the figures given in the *Statesman's Year-Book*, the estimated production of wheat in China for the year 1932 was 29·5 million metric tons, making the Republic the largest wheat producer in the world. This figure, however, should be accepted with reserve, and it is probably more accurate to place the production as varying between 15–21 million metric tons per annum.

Canada is the world's largest exporter of wheat, and 95 per cent. of her production is grown in Saskatchewan, Alberta and Manitoba. Except in south-west Alberta, which is under the influence of the Chinook wind, and in southern Ontario, Canadian wheat is mainly spring wheat of good, strong quality. Early ripening wheats are cultivated owing to the shortness of the summer, and the evolution of these wheats has made it possible for the wheatlands to be pushed further north with the development of the railways. The wheat is collected at Winnipeg, which is the largest wheat centre in the world.

In the *United States* the " spring " wheat producing area lies between the edge of the Laurentian Shield westwards through the Red River country of fertile Fargo clay loams and through the Black Soils of the Dakotas to the River Missouri, which roughly coincides with the isohyet of 15 ins. The chief " winter " wheat region lies to the south of the main maize belt, the southern limit being the summer isotherm of 68°F. Winter wheat is also cultivated in the north-west and in the east to the south of the Great Lakes. The leading wheat producing States are North Dakota (the chief producer in the United States) and Montana in the spring wheat belt ; Kansas (second to North Dakota as a producer), Oklahoma and Nebraska in the southern winter wheat area ; Washington (the third producing State) in the north-west ; Ohio and Illinois in the east.

The chief factors which favour production in Canada and the United States are the suitable climate, the fertile soil and vast extent of cheap, ploughable land relative to the number of inhabitants. " It was the opening up of the western prairies (of the United States) that brought the price of breadstuffs down to the level that has prevailed with little variation since 1884. These new lands required, or at least seemed to

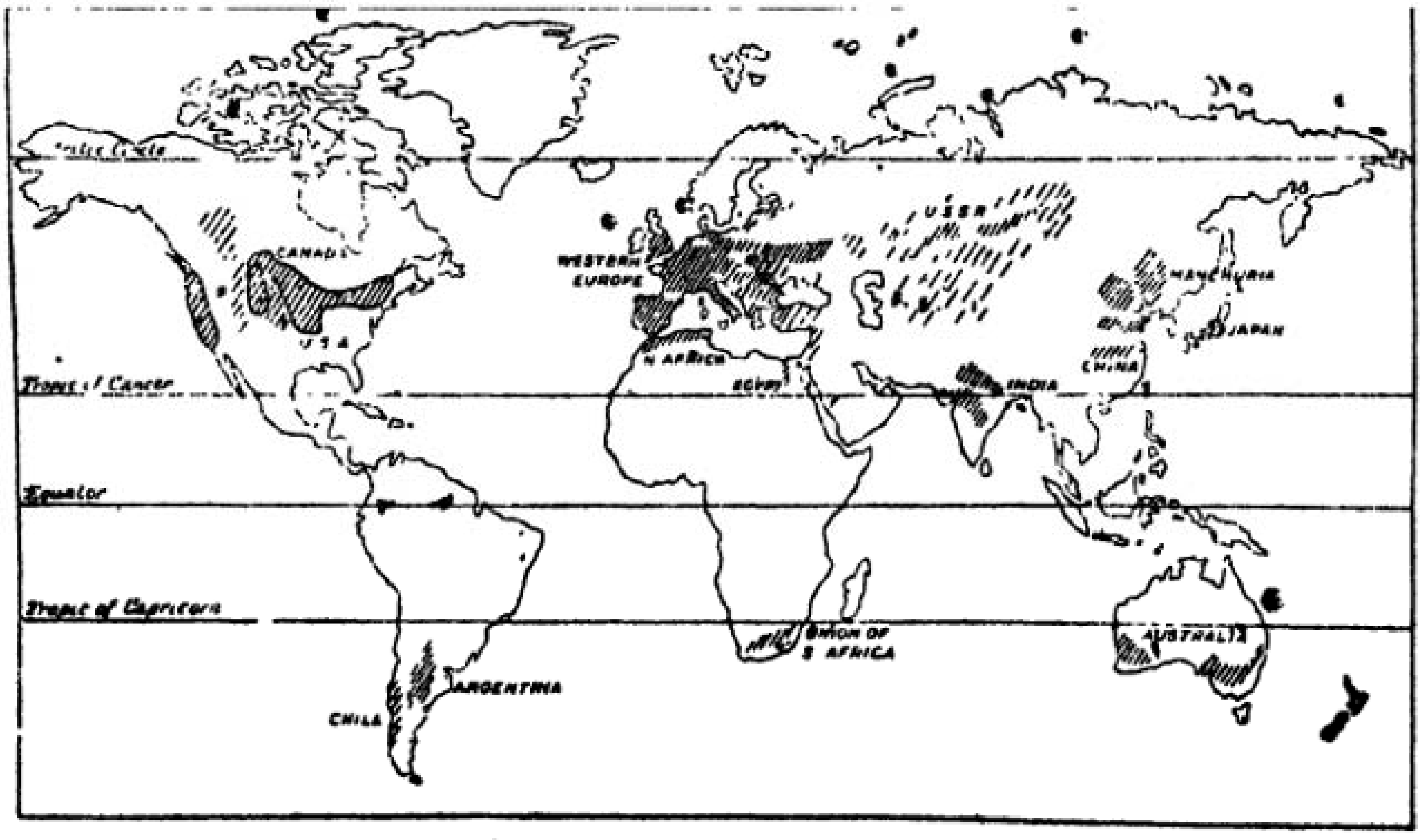


FIG. 98 : THE DISTRIBUTION OF WHEAT PRODUCTION.

require, no cultivating as it is understood by British farmers. The land was ploughed and seeded, and nothing more was done till harvest, when the grain was cut and threshed and the straw was burnt. Then the stubble was ploughed and the ground planted again with wheat. That the land only produced some 13 bushels per acre against 32 bushels grown in England did not much matter. The land was cheap and plentiful, and, when worn out, more was available further west."[1]

SOUTH AMERICA. The River Plate estuary is the important wheat-growing area of South America, the countries of *Argentina* and *Uruguay* both being producers. The yield per acre is low owing to a variety of causes, such as droughts, floods, locusts and extensive methods of production. Nevertheless, Argentina is second in world importance as a wheat-exporting country. The production of wheat in *Chile* is increasing, and among the South American wheat-producing states Chile is next in importance to the Argentine.

AFRICA. Wheat is cultivated along the Nile Valley in *Egypt*, and in the countries bordering the Mediterranean Sea, particularly in *Algeria*, *Morocco* and *Tunisia*. *South Africa* is generally unsuited for wheat, but the cereal is grown in the region round Cape Town.

ASIA has vast areas of land suited to wheat cultivation, Manchuria, especially, having enormous possibilities in this respect. At the present time, *China* is the foremost producer of wheat amongst Asiatic countries, and is followed by *India* and *Japan*. Northern China and the western portion of the Indo-Gangetic Plain, from the United Provinces to the North-West Frontier, are the principal areas of cultivation. Indian wheat is hard, mainly white wheat, and is a winter crop. Irrigation plays an important part in its production, but the principal factor is the cheapness of labour. The large production of China is insufficient to satisfy the needs of her population. *Turkish* wheat is grown mainly in the Smyrna region. In *Manchuria*, where production is over 1 million metric tons per annum, wheat is cultivated in the wide, open, level central plains, similar in fertility and climate to the North American prairies. As in North America, also, the development of railways and the use of up-to-date methods have been important factors.

AUSTRALASIA. The principal wheat-growing regions of *Australia* lie between the isohyets of 10 and 30 inches in the south-east (Victoria, New South Wales and South Australia) and in the Mediterranean region of Western Australia. The yield of the crop varies considerably with differences in rainfall. As a rule, the yield per acre is low owing to scanty rainfall, but the quality of the grain is high as a result of the warm and sunny weather. A large part of the Australian crop is exported. The wheat is of good quality, commands a high price and yields a high proportion of good quality grain. In *New Zealand* the yield per acre is high—over 30 bushels per acre—and in this respect the Dominion resembles Britain. The most important area is the Canterbury district of South Island where the wheat fields are encroaching on the sheep runs.

---

[1] *Wheat*, by A. Millar.

EUROPE. The average yearly production of wheat in Europe (excluding European Russia) is nearly 40 million metric tons. All the varieties are of the winter wheat type. The Mediterranean lands grow hard wheat of a low yield per acre. *Italy* averages 18 bushels per acre and *Spain* 14 bushels per acre. *France* has a large acreage under wheat (over 13 million acres in 1932) but the yield averages only about 22 bushels per acre. It is grown mainly in the Paris Basin and in those parts of the west which do not receive too much rain. *Hungary, Rumania* and *Bulgaria* produce crops of the very best hard wheat. Hungarian wheat produces flour of the highest quality. The dry climate is an important factor here, since flour of equal quality cannot be made in England, even with the same methods and machinery. On the *South German Plain* large crops are produced by intensive cultivation and the use of artificial manures. In *Britain*, wheat is grown to any great extent only in the dry, more extreme south-east of England. *Poland, Czechoslovakia and Yugoslavia* also are considerable producers.

U.S.S.R. The great grasslands of southern Russia produce vast quantities of spring wheat. The soil of the "black earth" region (see Fig. 161, p. 384) is an important factor here, but the yield per acre is low, partly owing to the kind of wheat grown, and partly because of the primitive methods of cultivation.

Commerce in Wheat

The Table below shows the pre-war and present day positions of the leading wheat-exporting and wheat-importing countries. All the leading exporters are "new" lands, which produce wheat mainly as a "money" crop in contrast to the older wheat producers of Europe, where wheat is cultivated for home use and where production has to be supplemented by imports.

The changes which have taken place in the relative importance of the wheat exporters are important. The most notable features are the post-war increase in exports from Canada, and the continued decline in the figures for the U.S.S.R. A more recent tendency is the decrease in exports from the United States, due to increased home consumption. India rarely has a large export nowadays, but is more frequently an importer, due partly to a growing preference for wheat in place of rice as a foodstuff and partly because of the varying production. The import figures show comparatively little change. Austria is still an importer, but does not import as much wheat as Czechoslovakia. A decline in imports to Germany and Italy during 1931 and 1932 coincided with an increase in home production.

The milling and export of wheat flour is fairly extensive, particularly in those wheat-producing countries which have a sufficiently dry climate.

The United States have the leading export of wheat flour, followed by Canada and Australia. China and Great Britain are the largest importers, Canada and Australia supplying the bulk of Britain's imports.

Commerce in Wheat

AVERAGE PER YEAR IN MILLIONS OF METRIC TONS

Exports					*Imports*				
1909-13			'25-29	1932	1909-13			'25-29	1932
U.S.S.R. ...	4·1	Canada ...	7·1	6·2	U.K. ...	5·2	U.K. ...	5·3	5·3
Argentina ...	2·4	Argentina ...	4·2	3·4	Germany ...	2·1	Italy ...	2·2	1·1
Canada ...	2·0	U.S.A. ...	2·8	1·3	Italy ...	1·5	Germany ...	2·0	·5
U.S.A. ...	1·4	Australia ...	1·9	3·1	Belgium ...	1·5	France ..	1·4	2·1
Rumania ...	1·3	U.S.S.R. ...	1·0	·4	France ...	1·0	Belgium ..	1·1	1·2
India ...	1·3	Hungary ...	·4	·1	Switzerland	·5	Brazil ..	·6	·8
Australia ...	1·1	Yugoslavia ..	·3	·1	Netherlands	·4	Netherlands	·6	·7
		N. Africa ...	·1	·7	Brazil .	·3	Japan ...	·6	·8
					Austria ...	·2	China ...	·1	·9

BARLEY

Barley (*hordeum vulgare*) will grow in a wide range of climate and is found farther north and at higher altitudes than the other cereals. In Norway, for example, it is cultivated as far north as lat. 70°N. Furthermore, it flourishes in any soil and under any climatic conditions which suit wheat, but has a wider range as regards temperature, rainfall and soil. Generally it is cultivated with oats in Northern Europe, where the conditions are too cold for wheat, and with wheat in the southern countries, which are too dry for maize. In the United States it is grown in California where, as in most Mediterranean countries (unless there is irrigation), the climate is too dry for oats and maize.

Production of barley in the countries of the Southern Hemisphere is insignificant, whilst Europe is responsible for almost half the world production.

The average world production of barley in 1909–13 was 38 million metric tons and, for 1925–29, 37·8 million metric tons. In 1932, world production was 40·8 million metric tons. The production of the principal countries is shown below.

Production of Barley

AVERAGE PER YEAR IN MILLIONS OF METRIC TONS

	1909–13		'25–29	1932
U.S.S.R. ...	9·0	U.S.A.	5·8	6·6
U.S.A. ...	4·0	U.S.S.R.	5·7	5·0
India ...	3·2	Germany	2·8	3·2
Germany ...	2·9	Japan & Corea	2·7	2·6
Japan & Corea	2·5	India ..	2·5	2·4
North Africa	1·9	Canada ..	2·3	1·8
Spain ...	1·6	Spain ..	2·0	2·9
Poland ...	1·6	North Africa	1·8	2·1
U.K. ...	1·3	Rumania ..	1·6	1·5
France ...	1·2	Poland ..	1·5	1·4
Canada ...	1·0	Czechoslovakia	1·3	1·5

Commerce in Barley

Since barley is not so rich in gluten as are wheat and rye, it is not of such value for the making of bread, and its chief value lies in its capability of being turned into malt. For this purpose it is grown in

England, Germany and the State of New York (U.S.A.), while in Scotland and Ireland it is used for making whisky by distillation. As a result of these factors the trade in barley largely involves those countries in which beer is a beverage, chiefly the countries of Western and Central Europe, though it is also widely grown for use as a food for stock. The effect of the War on the production and trade in barley was most marked, the most notable feature being the fall in Russian exports. These facts are revealed by an examination of the figures in the Table given below. The decrease in imports into Germany is again a notable feature.

Commerce in Barley

Average per Year in Millions of Metric Tons

Exports					*Imports*				
1909–13			'25–29	1932	1909–13			'25–29	1932
U.S.S.R.	3·70	U.S.A. ...	·70	·15	Germany ...	3·08	Germany ...	1·07	·48
Rumania	·35	Canada ...	·67	·22	U.K. ...	1·08	U.K. ...	·68	·51
Hungary .	·25	Rumania ...	·43	·54	Belgium ...	·33	Belgium ...	·28	·35
India . .	·23	U.S.S.R. ...	·30	·41	Netherlands	·21	Netherlands	·28	·39
North Africa	·23	North Africa	·21	·23	France ...	·12	France ...	·04	·44

OATS

Oats (*avena sativa*) have a wider range in latitude and will grow on a greater variety of soils than wheat, but they are best suited by a cooler and moister climate than that which favours wheat. The yield in bushels per acre is greater than that of wheat, but when the yields are expressed in weight, the superiority is not so marked, for whereas a bushel of wheat weighs about 60 lbs., a bushel of oats weighs anything between 25 lbs. and 50 lbs., the average being about 35 lbs. in Britain, 34 lbs. in Canada and 32 lbs. in the United States. The amount of oatmeal obtained also varies, only the best qualities yielding half their weight in meal. Oats are used largely as food for cattle and horses, and to some extent as human food.

The world production of oats for the years 1909–13 averaged 65·6 million metric tons; for the years 1925–29 the average was 68·9 million metric tons. In 1932, world production fell to 64·4 million metric tons. The average production of the leading countries is shown in the following Table.

Production of Oats

Average per Year in Millions of Metric Tons

	1909–13	1925–29	1932
U.S.A. ...	16·6	19·1	18·1
U.S.S.R. ...	13·4	14·7	11·2
Germany ...	7·7	6·5	6·6
Canada ...	5·4	6·1	6·0
France... ...	5·3	5·1	4·8
Poland... ...	2·8	2·3	2·4
U.K.	2·4	2·5	2·3

The ***United States*** stand first in the production of oats, though the amount available for export is insignificant. The producing areas are in the wetter and colder districts lying east and north of the wheat-producing areas. ***Canada*** produces about one-third as much oats as the United States. The principal areas of production are the Prairie Provinces, Ontario and Quebec.

In *Europe* the areas of oat-production are the more northerly and moister parts. *Germany* is the principal European producer, while *France*, *Poland*, *Britain*, the *Netherlands*, *Belgium*, *Denmark* and the *Baltic States* produce considerable quantities for home consumption.

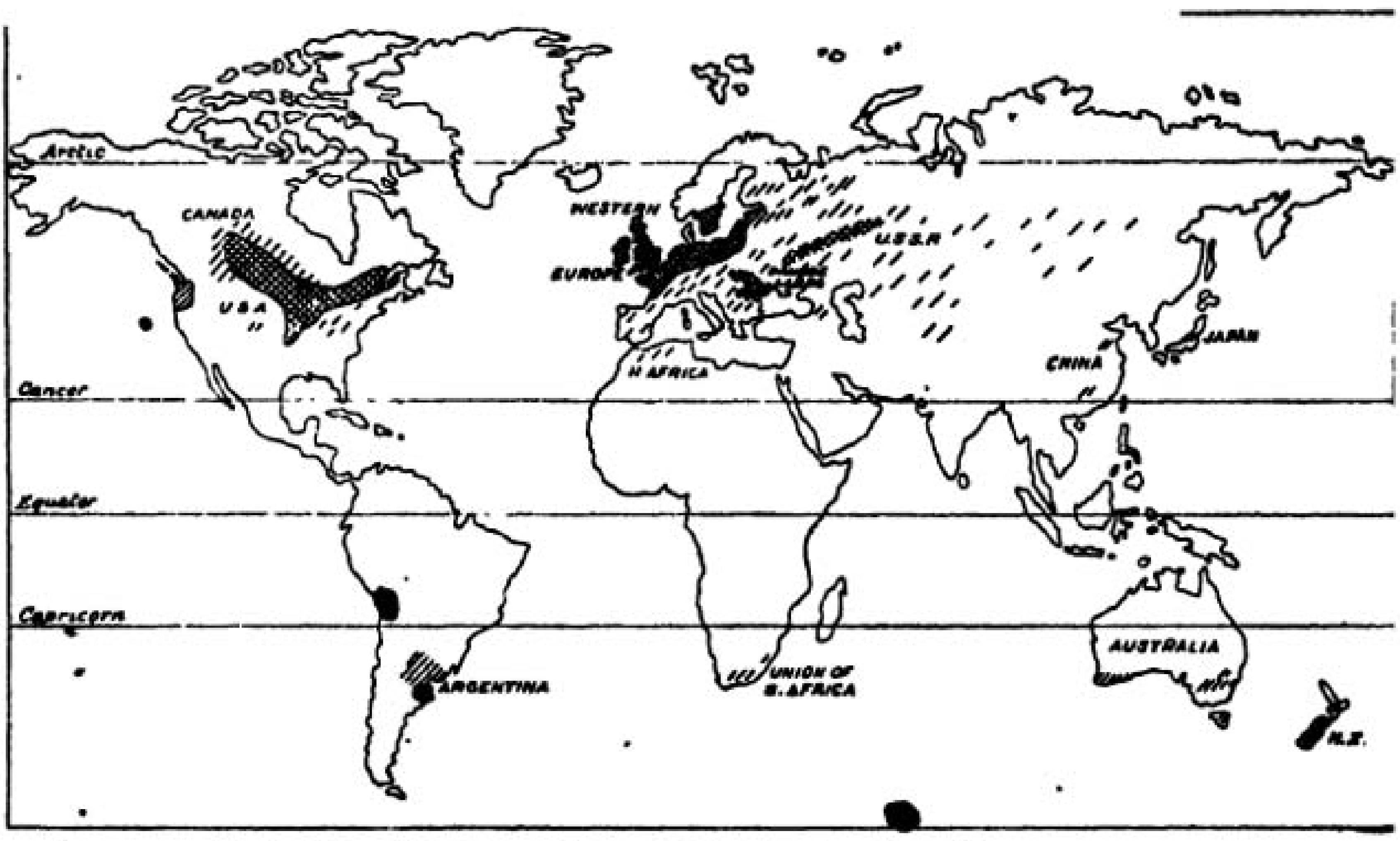


FIG. 99: WORLD DISTRIBUTION OF OAT PRODUCTION.

The *U.S.S.R.* is second only to the United States in production. The oats are cultivated rather to the north of the wheat areas, in regions which are too wet and too cold for wheat.

Argentina is the only important producing country in the southern hemisphere although *Chile* has a small export.

Commerce in Oats

As in the case of barley, only a very small proportion of the world's production of oats enters into international trade.

The European countries are predominant as importers, and several of the smaller producers rank high as exporters. Argentina, for example, produced only 1,000,000 metric tons in 1932, and yet she is easily the largest exporter of oats, exporting 70 % of her 1932 production.

Commerce in Oats

AVERAGE PER YEAR IN MILLIONS OF METRIC TONS

Exports					*Imports*				
1909–13			'25–29	1932	1909–13			'25–29	1932
U.S.S.R. ...	1·06	Argentina ...	·45	·71	U.K. ...	·89	U.K. ...	·36	·32
Argentina ...	·62	Canada ...	·24	·21	France ...	·39	Switzerland	·15	·22
Canada ...	·18	U.S.A. ...	·20	·05	Switzerland	·17	Belgium ...	·12	·05
Hungary ...	·17	Rumania ...	·05	·03	Germany ...	·14	Italy ...	·11	·17
Rumania ...	·16	N. Africa ...	·04	·02	Italy ...	·12	France ...	·09	·16
N. Africa ...	·10	Czechoslovakia	·03	·12	Belgium ...	·11	Netherlands	·08	·11
U.S.A. ...	·08				Netherlands	·11			

RYE

Rye (*secale cereale*) is a plant of great importance on the continent of Europe. In gluten content it stands next to wheat, and on the mainland of Europe it is cultivated over a very large area as a bread food. It has the great advantage of thriving better than other cereals on poor soils and in inhospitable climates. It is thus of inestimable value to the people of the great plain stretching from Holland, through Germany, into Russia, while it is also cultivated extensively in Scandinavia, France, Canada and the United States. In the latter country it is esteemed not so much for the grain as for the straw which is used in the manufacture of paste board and certain kinds of paper. In the United Kingdom it is cultivated to a small extent as a fodder crop, mainly because early ripening enables it to fill a gap between the exhaustion of root crops and the harvesting of lucerne and clover. In eastern Europe, the grain also provides vodka, rye whisky and other alcoholic drinks.

The production of rye on any considerable scale is restricted to a few countries. In 1909–13, the average yearly production of the U.S.S.R. was 18·9 million metric tons, of Germany 9·6, and of Poland 5·7, these three countries accounting for 76 per cent. of the average world production of 45 million metric tons. In 1932 world production was 47·6 million metric tons, the principal producers being the *U.S.S.R.* with 22·0 million metric tons, *Germany* with 8·4, *Poland* with 6·1, *Czechoslovakia* with 2·2, the *United States* with 1·0 and *France* with ·9.

Rye enters very little into world trade, for in many of the countries in which it is cultivated it is used for home consumption. Europe takes the bulk of the imports, whilst the U.S.S.R., Canada, Poland, Argentina and Hungary are the leading exporters.

MAIZE

Maize (*zea maïs*) is known in America as " corn ", in England as " Indian corn " and in Africa as " mealies ". It grows to a greater height than any other cereal and has a higher yield of grain per acre than wheat. The ideal climate for its growth is " one with a summer 4½ to 7 months long without frost, the middle portion hot both day and night, sunny skies, sufficient rain to supply the demand of a rapidly growing and luxuriant crop, falling at such intervals as best to provide sufficient moisture without ever making the soil actually wet."[1]

The mean temperature of the warmest month is of some importance, and the most satisfactory results are obtained where this lies between 75°F. and 80°F. The soil should be moist but well-drained, so that loams with a considerable amount of sand are the most suitable. Maize

[1] *Agricultural Census of U.S.A.*

is thus a crop essentially suited to savannah lands and quite unsuited to lands which have long, dry summers, such as those with a Mediterranean type of climate. Maize grown in tropical lands at high altitudes gives the most abundant yield.

Maize is used principally for the fattening of cattle, pigs and poultry. The maize belt of the United States produces half the pigs and one-third of the cattle in the country. Maize oil (a substitute for olive oil), starch, glucose and meal, which is used for porridge (hominy), are derived from the grain. The stalks are useful as fuel, and the leaves for thatching.

Principal Maize-Producing Regions

NORTH AMERICA. Originally a native of Mexico and Peru, maize has gradually spread northwards into its present typical area of cultivation in the *Central States of the U.S.A.* These States provide ideal conditions for the growth of maize, and Iowa (the chief producer), Nebraska, Illinois, Minnesota, Missouri, Indiana and Ohio, produce nearly 50 per cent. of the total maize crop. Kansas also cultivates maize, but, as it has a lower rainfall than the other States, its yield per acre is smaller. The total area under maize in the United States is about 100,000,000 acres, nearly twice as much as that under wheat. The climate and soil conditions in the maize belt are very favourable: the soil is a deep, fertile black earth; the day temperatures are high and the nights are warm; whilst rain falls during the ripening season, *increasing until the end of July.*

The enormous increase in maize cultivation in the United States during the past thirty years has been due to the demand created by stock-rearing, the centre of which is Chicago, with its vast meat-canning industries.

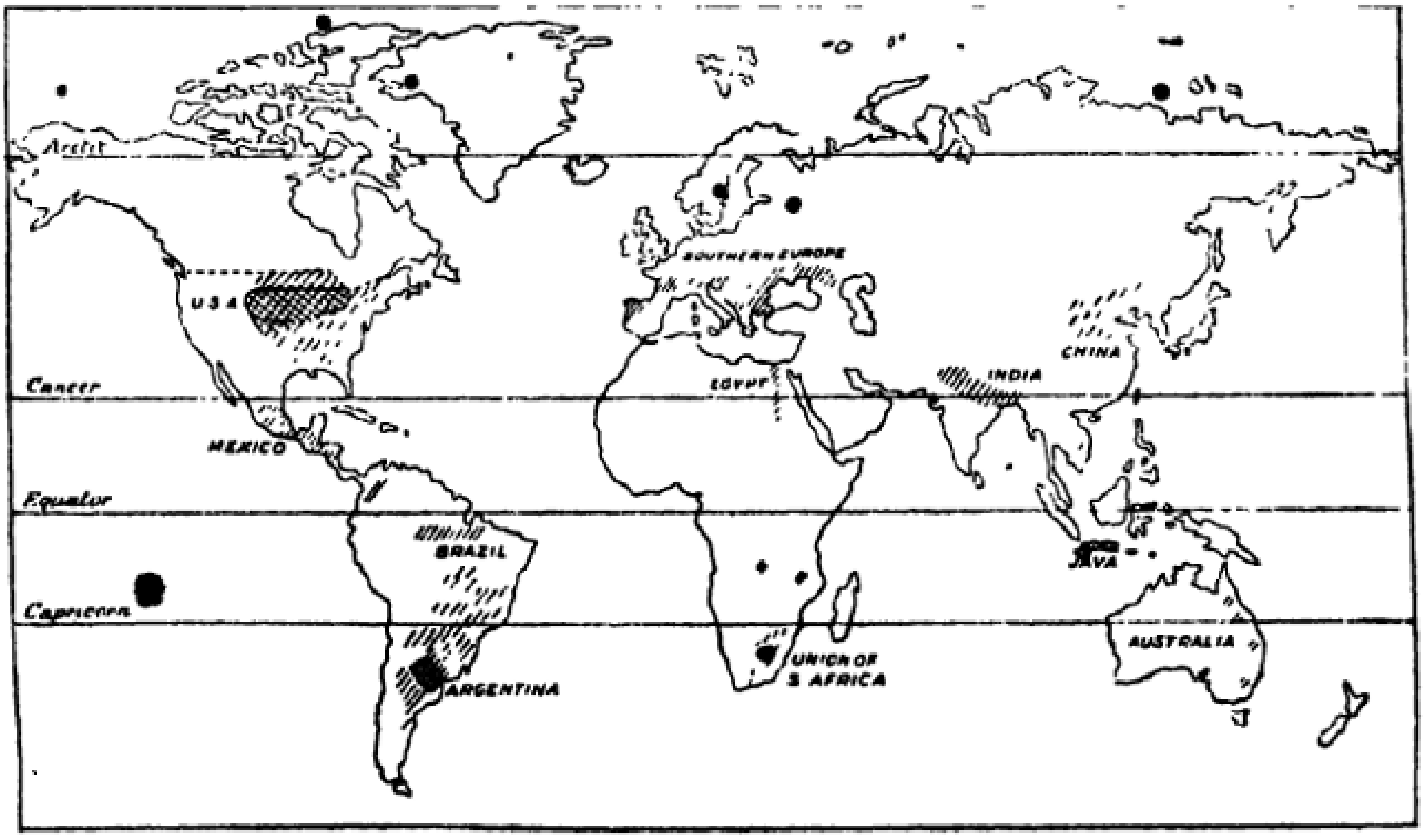


FIG. 100: WORLD DISTRIBUTION OF MAIZE PRODUCTION.

South America. *Argentina* has areas suitable for maize cultivation and the output of *Brazil* is increasing. *Bolivia, Chile, Peru* and *Uruguay* also are producers.

Central America. In *Mexico*, maize is the principal food of the people, and has been so from the time of the Aztecs, whose civilization was based on maize, the only cereal native to America.

Africa has large areas of savannah lands suited to the cultivation of maize, but at present it produces less than 2 per cent. of the world output. There are great possibilities for the crop in Rhodesia and in East and West Africa. The principal producers at present are *Egypt* and the *Union of South Africa*.

Asia. The principal producers are the *Netherlands East Indies, Manchuria, India, Turkey* and the *Philippines*. The yield is low, being only about 14 bushels per acre, and even a little lower in India, but Manchuria is an exception, the yield here being as high as 25–28 bushels per acre. The Chinese output is about 2½ million metric tons, but this is merely a rough estimate and is therefore not included in the Table below.

Australia. Maize is the most important crop in *Queensland*, whilst in *New South Wales* it is second only to wheat. The total output is, however, small.

Europe. In *South-Eastern Europe*, where the climate becomes more of the summer rain type, maize is important in *Rumania, Yugoslavia, Hungary* and *Italy*. The area of cultivation in Italy is in the north, where it is used to make a common food known as "polenta". *Bulgaria, Spain*, southern *France, Greece, Portugal* and *Czechoslovakia* also are producers.

U.S.S.R. The production of maize has increased considerably in post-war years, particularly in the Ukraine.

Production of Maize

Average per Year in Millions of Metric Tons

	1909–13		'25–29	1932
U.S.A.	68·9	U.S.A.	70·2	73·8
Argentina	4·9	Argentina	7·3	6·7
Brazil	3·8	Rumania	4·5	6·0
Mexico	3·4	Brazil	4·1	5·1
Rumania	2·7	U.S.S.R.	3·7	3·4
Italy	2·5	Yugoslavia	3·0	4·8
India	2·1	Netherlands East Indies	2·9	1·9
Egypt	1·5	Italy	2·4	3·0
Hungary	1·5	Mexico	2·0	2·0
U.S.S.R.	1·3	India	2·0	2·3
Netherlands East Indies	1·3	Egypt	2·0	1·9
Union of South Africa	·8	Hungary	1·8	2·4
		Manchuria	1·7	1·5
		Union of South Africa	1·6	·8

The average world production for 1909–13 was 105·9 million metric tons; in 1932 world production was 124·4 million metric tons.

Commerce in Maize

Of the total world production of maize, only about 14 per cent. enters into international trade. The principal importing and exporting countries are shown in the Table below.

Commerce in Maize

AVERAGE PER YEAR IN MILLIONS OF METRIC TONS

Exports					*Imports*				
1909–13			'25–29	1932	1909–13			'25–29	1932
Argentina ...	2·9	Argentina ...	5·5	7·1	U.K. ...	2·1	U.K. ...	1·6	2·5
Rumania ...	1·0	Rumania ...	·8	1·7	Germany ...	·8	Germany ...	1·1	·7
U.S.A. ...	1·0	U.S.A. ...	·5	·2	Netherlands	·5	Netherlands	1·1	1·7
U.S.S.R. ...	·7	S. Africa ...	·4	·2	France ...	·5	France ...	·7	1·2
Bulgaria ...	·2	Yugoslavia ...	·3	·2	Belgium ...	·5	Belgium ...	·6	·8
Hungary ...	·2	U.S.S.R. ...	·1	·3	Italy ...	·4	Italy ...	·6	·6
		Bulgaria ...	·1	·2	Canada ..	·3	Denmark ...	·5	·9
		N.E.I. ...	·1	·2	Denmark ...	·3	Canada ...	·3	·2
					Austria ...	·3	Spain . .	·3	·3
					Spain ...	·2	I.F.S. ...	·3	·6
							Czecho-slovakia	·3	·3

A comparison of the above Table with the Production Table shows what a large percentage of the Argentine crop is exported, whilst very little of the crop grown in the United States enters into world commerce, because the maize is required for stock feeding. The exports of the United States are still declining, whilst those of the Argentine are increasing and now provide about two-thirds of the world's total maize exports. Argentina exports its maize through Buenos Aires and Mar del Plata, and South Africa through Durban. Rumania and Yugoslavia utilise the Danube and export from Galatz, Braila, Sulina and Constanza. All the principal maize-importing countries, with the exception of Canada, are European.

RICE

Rice (*oryza sativa*) is one of the major cereals of the world, for about half the total world population use it as their chief food. It is the staple food of the people of the densely populated monsoon lands of South-Eastern Asia, where, in husk form, it is known as "paddy". It is to them what wheat is to the western nations, though, bulk for bulk, its food value is not nearly so great. Another important point is that rice production demands a large, cheap labour supply.

There are hundreds of varieties of rice, but they can be grouped into (1) *Upland* rice, cultivated on hill slopes, and (2) *Swamp* rice, cultivated on flooded level fields. All the most common varieties require a high summer temperature and they must be cultivated in fields capable of being flooded. To this end, the fields are carefully embanked to retain the water, and, on hill slopes, they are cut into terraces, one below the other, and each one with its retaining wall. If insufficient water is obtained from the rains or the overflow of rivers, irrigation is practised.

The amount of flooding required varies with the stage of growth of the plant. When the latter is very young two inches of water may be enough, but when the stem is strong there is no limit to the amount which may be allowed. In general, the rainfall should be between 40 and 80 inches, the higher amounts producing the better crops. During the growing season the mean monthly temperature should be over 70°F. When the flowers appear the plant needs dry, hot weather to ripen the seeds, and a period with a temperature of over 80°F. is required.

Suitable soils for rice cultivation vary greatly in character, but they must, in any case, be capable of holding irrigation water. Friable loams which allow root development, with a subsoil of clay to hold up the water, are ideal, and these soils occur in deltas. In favourable conditions, rice grows with great rapidity, two crops being frequently obtained in one year from the same ground. As different varieties ripen at different times, a farmer who has a mixture of soils on which a selection of kinds can be grown can obtain as many as five harvests in a year.

The yield varies greatly but the average is higher than that of any other cereal. The world average yield for the years 1909–13 was about 26 bushels per acre while for the years 1928–32 the average was 23 bushels per acre. Spain had a yield of over 90 bushels per acre in 1932, whilst the yield in Costa Rica has been lower than 4 bushels per acre. These examples are, of course, the two extremes.

Principal Rice-Producing Regions

ASIA. *China* is the greatest rice-growing country in the world. The crop, which is cultivated over the whole of central and southern China, is all used in the country although only a part of the population depends mainly on rice for its food.

India produces nearly as much rice as China. Rice is the chief cereal grown in India, though not more than one-third of the population subsists on it. The wet summers of the southern Malabar coast, the Coromandel coast, the Ganges plain, particularly the middle and lower portions, and the Brahmaputra valley north of the delta, are very favourable to rice production. On the Deccan Plateau and in the Indus valley rice is grown with the aid of irrigation. Very little of India's rice is available for export, except from Burma.

Burma produces large quantities of rice in the littoral districts, the delta of the Irawadi and Upper Burma. The quality of the rice of Upper Burma is poor and is unsuitable for export. Over 90 per cent. of the rice exported from British India is sent from Burma, with Rangoon as the principal exporting centre. *Ceylon* also grows rice.

Japan produces large quantities of rice by intensive cultivation in all parts except the north, but large amounts have to be imported. *Corea* is becoming an important producer and now exports considerable quantities to Japan. *Indo-China* and *Siam* also grow large quantities. The *East Indies* are great producers but have very little for export. The *Malay States* and the *Philippine Islands* grow rice as the main food crop of their populations.

NORTH AMERICA. *The United States* produce rice on the wide level prairies in the south-west of Louisiana, the south-east of Texas and in Arkansas. The rice is grown by irrigation with water obtained from artesian wells, while machinery is sometimes used for harvesting. Part of California also produces "irrigated" rice, notably the Sacramento Valley.

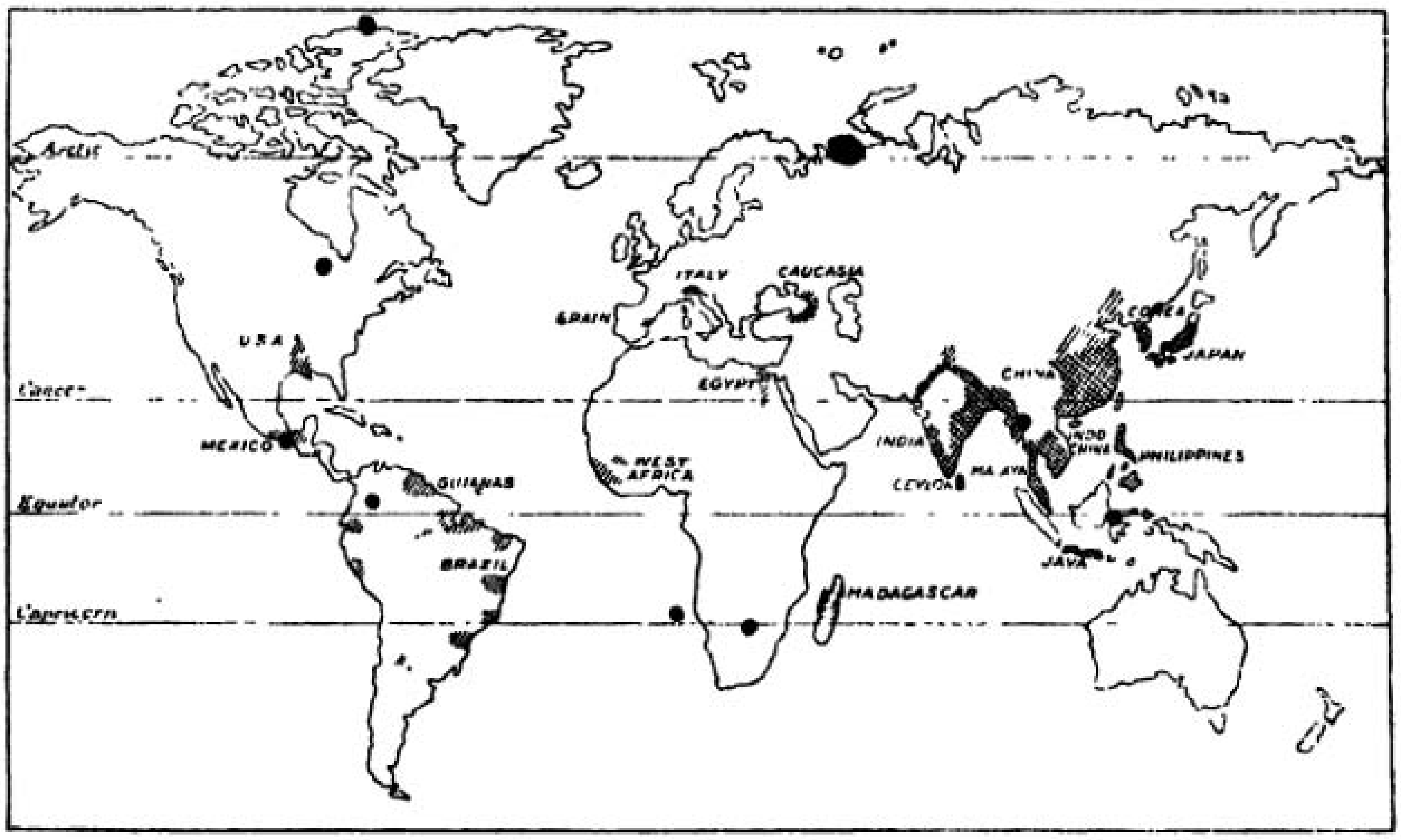


FIG. 101: WORLD DISTRIBUTION OF RICE PRODUCTION.

SOUTH AMERICA grows small quantities on the coastal plains of the tropical states, *Brazil* being by far the principal producer.

EUROPE. *Italy* (in the Po valley) and *Spain* both grow rice, the cultivation in both cases being favoured by cheapness of labour.

AFRICA has centres of cultivation in ***French West Africa***, ***Egypt***, ***Madagascar*** and ***Sierra Leone***.

Production of Rice

AVERAGE PER YEAR IN MILLIONS OF METRIC TONS

	1909–13		'25–29	1932
China ...	50·0[1]	China ...	50·0[1]	50·0[1]
India ...	48·6	India ...	47·5	46·8
Japan ...	9·1	Japan ...	10·8	10·9
Indo-China	5·4	Indo-China	6·0	5·8
N.E.I. ...	4·1	N.E.I. ...	4·8	5·4
Siam ...	2·8	Siam ...	4·2	5·2
Corea ...	1·8	Corea ...	2·7	3·0
Philippines...	·8	Philippines...	2·2	2·1

[1] Rough estimate only.

Excluding China, the average world production for 1909–13 was 78·3 million metric tons, and for the years 1925–29 the average was 86·3 million metric tons. In 1932, world production was 87·3 million metric tons.

Commerce in Rice

Although rice forms the staple food of a very large part of the human race, the total world trade amounts only to some 13 per cent. of the world production, and of this about 50 per cent. is inter-Asiatic, *i.e.*, between the Asiatic rice-growing and rice-eating peoples.

The populations of several of the chief rice-growing countries are so dense that these countries have no surpluses for export to Europe and America, and, generally speaking, rice is available for export only from those rice-producing regions which have small populations. The great rice-growing countries of China and Japan cannot export rice: they even have to import. In fact, China and Japan import more rice than any other country, Japan's imports being obtained almost wholly from Corea and Formosa. Burma supplies nearly all India's export, and Burma, Indo-China and Siam are the only countries which furnish any considerable supply to Europe.

Commerce in Rice

AVERAGE PER YEAR IN MILLIONS OF METRIC TONS

Exports					*Imports*				
1909–13			'25–29	1932	1909–13			'25–29	1932
India (mainly Burma) ...	2·3	India and Burma ...	2·10	2·14	N.E.I. ...	·4	Japan ...	1·5	1·5
Indo-China	·9	Indo-China...	1·45	1·12	Ceylon ...	·4	China ...	·9	1·3
Siam ...	·8	Siam ...	1·42	1·45	Japan ...	·4	N.E.I. ...	·6	·4
Formosa ...	·1	Corea ...	·70	1.00	China ...	·3	Ceylon ...	·5	·4
Corea ...	·08	Formosa ...	·27	·49	Germany ...	·2	Malaya ...	·5	·4
Italy ...	·06	Italy ...	·19	—	Malaya ...	·2	Germany ...	·2	·3
Persia ...	·06	U.S.A. ...	·18	·25	France ...	·2	Cuba ...	·2	·2

MILLETS

Millets are grains belonging to several species of plants, of which the two most important are the Great Millet (*sorghum vulgare*) and the spiked or Bulrush Millet (*pennisetum typhoideum*). All the millets come under the general name of *dry grains* because they are not grown with the aid of irrigation. After wheat, maize and rice, they are the most important of food grains. Probably a quarter of the world's population lives on them, and certainly in India far more people live on millet than on rice.

Great Millet, or Guinea Corn, known in Africa as "durrah", is grown extensively in Africa and in India, especially in Bombay and Madras. It makes a good human food as well as good fodder for cattle, and is extensively used for both purposes. It is exported from Bombay to Aden, Arabia and Abyssinia.

Bulrush Millet is grown in Bombay as a summer crop, and is reaped in September. A species of *sorghum* is used in the United States for making sugar.

There is little international trade in millets.

OTHER FOOD CROPS

POTATOES

Potatoes (*solanum tuberosum*) are a very important foodstuff. They are indigenous to the high and dry parts of the Andes in Chile and Peru, and were introduced into Europe in the 16th century. The cultivated plant is widely used as a foodstuff owing to the ease with which it may be cultivated, its great productivity and its capacity for quick acclimatization. It has an extraordinarily wide range in latitude, but a moist and cool climate is the most suitable. Thus, the potato thrives in such different localities as Ireland and the North German plain, the former with a considerable rainfall and a low range of temperature, and the latter with a comparatively wide range of temperature and a low rainfall. The plant is subject to disease, and much time and research work have been spent in evolving varieties which are disease-resisting. A disease in the crop has several times caused widespread famine in Ireland.

The *U.S.S.R.* is the principal producer, followed by *Germany* and *Poland*. In North Germany, potatoes are the chief food of 70 per cent. of the working classes, and about one-quarter of the German crop is used in the manufacture of alcohol, starch, flour, explosives and drugs. In *Ireland*, the potato is the staple article of diet amongst the country people. Potatoes are also widely grown in Great Britain, France, Czechoslovakia and other European countries, as well as in Canada and the United States. The climate of the Mediterranean countries is not well suited to the growth of potatoes, and in the Southern Hemisphere their growth is limited by reason of the sparsity of population.

Production of Potatoes

AVERAGE PER YEAR IN MILLIONS OF METRIC TONS

	1909–13		'25–29	1932
Germany	38·0	U.S.S.R.	43·5	47·2
Poland	24·8	Germany	38·1	47·0
U.S.S.R.	20·2	Poland	26·5	30·0
France	14·3	France	14·3	16·5
U.S.A.	9·7	U.S.A.	10·3	9·7
British Isles	6·9	Czechoslovakia	8·6	9·3
Spain	3·1	British Isles	7·8	8·7

The average world production for the years 1909–13 was 149 million metric tons whereas of late years production has reached over 200 million metric tons per annum.

Potatoes are grown largely for home consumption, mainly because they are perishable and bulky, and are not, therefore, profitably transported over great distances. Only 3 per cent. of the total production enters into international trade. The principal exporters are the Netherlands, followed by Spain, Canada and Belgium. Great Britain takes a large percentage of the total imports.

SUGAR

Sugar is obtained from many different sources, but only two are of outstanding importance: (1) the juice from the stalk or cane of the *sugar-cane* and (2) the juice from the root of the *sugar-beet*. The cane and the beet are produced in entirely different regions. The sugar-cane is a tropical product grown, in varying quantities, in nearly all tropical and sub-tropical countries, whilst the sugar-beet is a temperate product cultivated mainly in the North Temperate Zone.

" An important distinction must be observed between the economy of the cane and beet industries respectively. In the cane-sugar industry, the production of sugar is to all intents and purposes the sole aim of the crop. The value of the beet crop lies not only in the sugar which is obtained from it, but also in its function in promoting the fertility of the soil. Beet-sugar may, therefore, in a sense, be regarded as a by-product, rather than a primary product. . . . . The reason why all Governments cling so stubbornly to beet culture is not to be found mainly in considerations of financial policy, but in agricultural and social considerations. Beet culture in itself, without reference to sugar production, is for many reasons a vital condition of all intensive agriculture . . . . . It is, in fact, largely for its effect on soil fertility that the crop is grown in Europe to the extent, including European Russia, of about 7 million acres"[1].

Cane Sugar

The sugar-cane (*saccharum officinarum*) is a species of grass which has jointed stalks and is somewhat similar in appearance to maize or bamboo. It is a perennial plant, and the same root will continue to bear canes for some 25 years, but in practice it is usual to insert fresh cuttings every two or three years so as to keep up a supply of vigorous young plants, and to avoid the difficulty of removing the large roots of old plants.

The sugar-cane is essentially a tropical product, requiring a damp soil and a moist, hot climate. It grows best on rich, porous clays and on alluvial soils at sea-level. Indeed, nearness to the sea appears to be beneficial. Sugar cane does not succeed in hilly country, and it cannot withstand frost. The temperature should be at least 80°F. in the warmest month, and the rainfall should exceed 40 inches per annum. Where the rainfall is insufficient, however, the sugar-cane can be grown under irrigation. Its partiality for a wet soil makes it a suitable crop for rice fields, and in its requirements it is not greatly different from rice. An abundant supply of cheap native labour is necessary, as the canes are cut by hand, and the climate in the producing areas will not permit manual labour by white men.

India, Cuba and *Java* are outstanding in the production of cane sugar, but the Indian production is of poor quality and is insufficient for home needs. The British West Indian industry is passing through a bad period, due largely to the low prices prevailing, and preferences are now accorded by Great Britain with the object of supporting the industry.

The principal countries producing sugar-cane are given in the Table below. The production of the Union of South Africa comes mainly from Natal and that of the United States from Louisiana. In the British West Indies the largest producers are Trinidad, Barbados and Jamaica. The output of Brazil and Peru comes from the coastal regions, whilst that of Argentina from the irrigated Sub-Andine region at the foot of the Andes. The coast of Queensland (Australia) is admirably suited to the production of sugar, but the industry is handicapped by the lack of suitable labour and the result of the "White Australia" policy. The great decrease in production in Cuba since 1929 is due to Government restrictions on the acreage planted. As a result, India has regained her pre-war position as the world's leading producer of cane-sugar.

---

[1] *Report on the Sugar Beet Industry at Home and Abroad*: H.M. Stationery Office.

Production of Sugar from the Sugar-cane

Average per Year in Millions of Metric Tons

	1909–13		'25–29	1932
India	2·40	Cuba	4·72	2·03
Cuba	2·10	India	3·02	4·72
Java	1·35	Java	2·50	1·40
Hawaii	·52	Hawaii	·80	·92
Philippines	·37	Brazil	·71	·97
Porto Rico	·33	Philippines	·70	1·15
Brazil	·28	Formosa	·62	·63
U.S.A.	·26	Porto Rico	·62	·74
Mauritius	·22	Australia	·51	·54
Australia	·20	Argentina	·40	·35
Peru	·18	Dominica	·38	·36
Argentina	·18	Peru	·36	·39
Formosa	·17	British West Indies	·25	·22
British West Indies	·15	Union of South Africa	·24	·33
Mexico	·15	Mauritius	·23	·25
British Guiana	·10	Mexico	·18	·21
Dominica	·09	British Guiana	·12	·14
Union of South Africa	·08	U.S.A.	·11	·20

World production for the years 1909–13 averaged 9·58 million metric tons and for the years 1925–29 the average was 17·2 million metric tons. The figure for 1932 was 16·7 million metric tons.

Beet Sugar

The sugar-beet is a root crop which is raised annually from seed. It is "grown throughout the north temperate zone under a wide variety of climatic conditions—from the dry regions of the western United States, where irrigation has to be practised, to the moist and less sunny climate of this country. Generally, the sugar-beet likes a long growing period, with the latter part warm and sunny; except on heavy soils, it needs a considerable amount of rain from mid-June to early August, moderate rainfall in August and dry warm weather in September, October and November. Owing to the depth to which the tap root reaches in its search for moisture, it can withstand prolonged periods of drought. The most suitable type of soil for sugar-beet is a deep, friable loam, which is free from stones and permits the preparation of a good seed bed, without being so light as to suffer from drought or heavy enough to make lifting too expensive. In England, beet can be grown successfully on a wide variety of soils, provided they are not shallow."[1] There must also be freedom from frost, from seed-time to harvest, and abundant labour is essential, since the seed has to be sown, the young plants thinned out and the fields constantly hoed to keep down weeds and promote growth.

The climatic conditions are suitable for white labour, since sugar-beet is a temperate zone crop, but the labour is much dearer than in the tropical lands where the sugar-cane is grown. After the sugar has been extracted from the beet, the refuse is returned to the farmers for use as fodder for cattle. The leaves and tops of the beets also are used as fodder.

---

[1] *Report on the Sugar Beet Industry at Home and Abroad:* H.M. Stationery Office.

The densely populated temperate lands of Western and Central Europe are the great beet-growing countries, and the availability of first-class machinery, together with constantly improving methods and varieties, have brought about a high sugar yield from the beet. Nevertheless, the yield of sugar from an acre of beet (about 10 metric tons per acre) is only one-half the yield from an acre of cane.

Sugar-beet cultivation increased rapidly at the beginning of the twentieth century, largely owing to the encouragement—financial and otherwise—which the governments of the various countries gave to the industry with a view to setting it on its feet. Great Britain made remarkable advances in this direction, although she produces at present not more than one-quarter of her sugar requirements.

Europe, the *U.S.S.R.* and the *United States* are the outstanding producers of sugar beet. Normally, *Germany* is the principal producer, followed by *Czechoslovakia*, the *U.S.S.R.*, the *United States*, *France* and *Poland*. The leading producing countries are shown in the Table below, the figures of which should be compared with those for cane sugar. The main producing areas in Germany are in the Magdeburg district and in Lower Silesia. In Czechoslovakia production is widespread whilst the Ukraine is the leading area in the U.S.S.R. In the United States the beet is grown in the north-east (Michigan, New York) and under irrigation in the west (California, Utah and Colorado). The Paris Basin is the leading area in France.

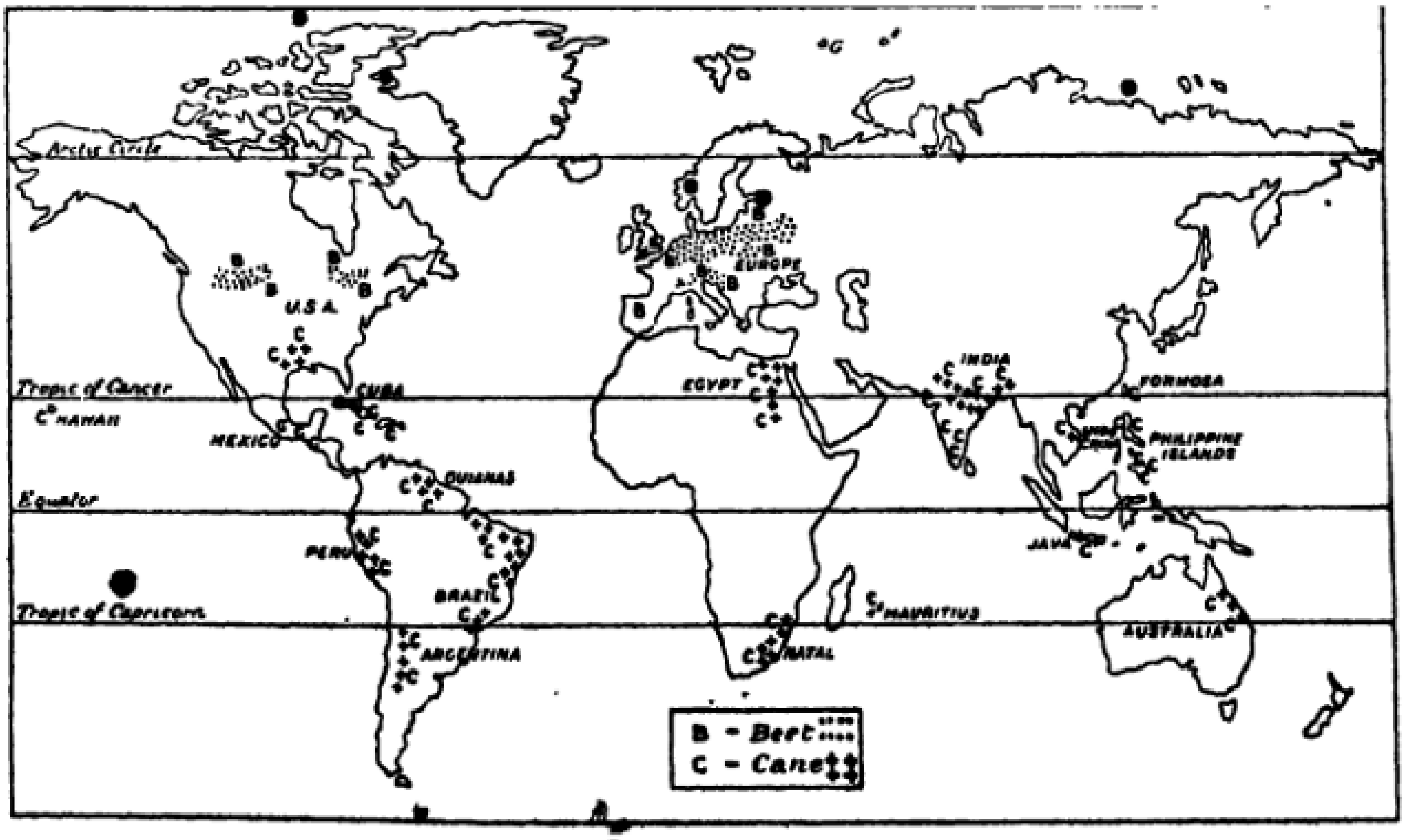


FIG. 102 : THE DISTRIBUTION OF SUGAR PRODUCTION.

Production of Sugar from the Sugar-beet

AVERAGE PER YEAR IN MILLIONS OF METRIC TONS

	1909–13		'25–29	1932
Germany ...	1·87	Germany ...	1·77	1·09
U.S.S.R. ...	1·44	Czechoslovakia	1·18	·63
Austria ...	1·04	U.S.S.R. ...	1·11	·83
France ...	·76	U.S.A. ...	1·02	1·32
Poland ...	·69	France ...	·83	1·00
U.S.A. ...	·63	Poland ...	·67	·42
Hungary ...	·45	Italy	·32	·32
Belgium ...	·26	Netherlands ...	·28	·23
Netherlands ...	·22	Belgium ...	·27	·26
Italy ...	·21	Spain ...	·22	·23
		U.K.	·14	·34

World production for the years 1909–13 averaged 7·94 million metric tons (Europe 5·86 million metric tons), and for 1925-29 the average was 8·74 million metric tons (Europe 6·48 million metric tons). In 1932 the figures were, respectively, 7·74 and 5·46 million metric tons.

The British Sugar Beet Industry

Various attempts have been made to establish a sugar beet industry in Britain, but it was not until the passing of the British Sugar (Subsidy) Act, 1925, that the industry began to assume importance. " One of the most striking features of the history of sugar in this country is the fact that Great Britain remained so long without a home-grown sugar industry. The sugar beet industries in Europe were all heavily subsidised and found an outlet for their surplus in the open market offered by the United Kingdom, which thus had abundant supplies of cheap sugar. The severity of this competition rendered nugatory the numerous attempts to start the sugar beet industry in this country. The almost complete disappearance of European sugar supplies during the War forced this country to rely on the cane sugar countries for its supplies and directed the attention of the Government to the importance of a home sugar beet industry.

" The test of cultivation on commercial lines has confirmed the anticipation that this country is eminently suitable for sugar beet cultivation ; in 1930, as much as one-fifth of our total sugar supplies were home grown. The sugar content of the beets has compared favourably with that obtained abroad. The purity of the beets grown has been such that a high extraction of sugar by the factories has been possible. The white sugar made has been of high quality. The crop has helped to maintain arable cultivation in those districts of England where it is largely grown. The value of the various by-products as a substitute for roots and other feeding-stuffs for livestock has been proved. Their utilization is tending to maintain, if not to increase, the stock-carrying capacity of arable farms. During the prevailing depression in agriculture, the farmer has found in sugar beet a saleable crop which has generally *yielded* a profit at a time when cereal prices have been abnormally low. The industry has provided substantial employment in the field, at the factory and in auxiliary industries, including transport. The agricultural and industrial employment provided suggests that if the industry were established permanently in this country an increase in rural population in the beet-growing areas would result."[1]

The sugar beet factories in Britain are situated at Cupar in Fife; Poppleton and Selby in Yorkshire; Colwick and Kelham in Notts.; Allscott in Salop; Kidderminster in Worcestershire; Spalding, Bardney and Brigg in Lincs.; Felstead in Essex; Wissington, Cantley and King's Lynn in Norfolk; Peterborough in Northants; Ely in Cambs.; and Ipswich and Bury St. Edmunds in Suffolk.

Commerce in Sugar

The commerce in sugar is summarised in the Table below. About 11 per cent. of the total production of cane and beet sugar enters into international trade.

Commerce in Sugar

AVERAGE PER YEAR IN MILLIONS OF METRIC TONS

Exports

1909–13			'25–29	1932
Cuba	1·83	Cuba	4·63	2·66
N.E.I.	1·31	N.E.I.	2·15	1·51
Germany	·79	Hawaii	·79	·92
Austria	·77	Czecho-slovakia	·72	·30
Hawaii	·49	Porto Rico	·53	·81
Porto Rico	·29	Formosa	·52	·88
Philippines	·26	Philippines	·51	1·02
U.S.S.R.	·26	Dominica	·32	·44
Mauritius	·21	Peru	·29	·33

Imports

1909–13			'25–29	1932
U.S.A.	2·73	U.S.A.	5·07	4·34
U.K.	1·80	U.K.	1·84	2·11
India	·50	India	·80	·42
Japan	·30	China	·75	·35
China	·20	Japan	·70	·75
Canada	·27	Canada	·40	·39
Turkey	·18	France	·19	·13
Switzerland	·11	N. Africa	·18	·25
Persia	·11	Switzerland	·11	·16

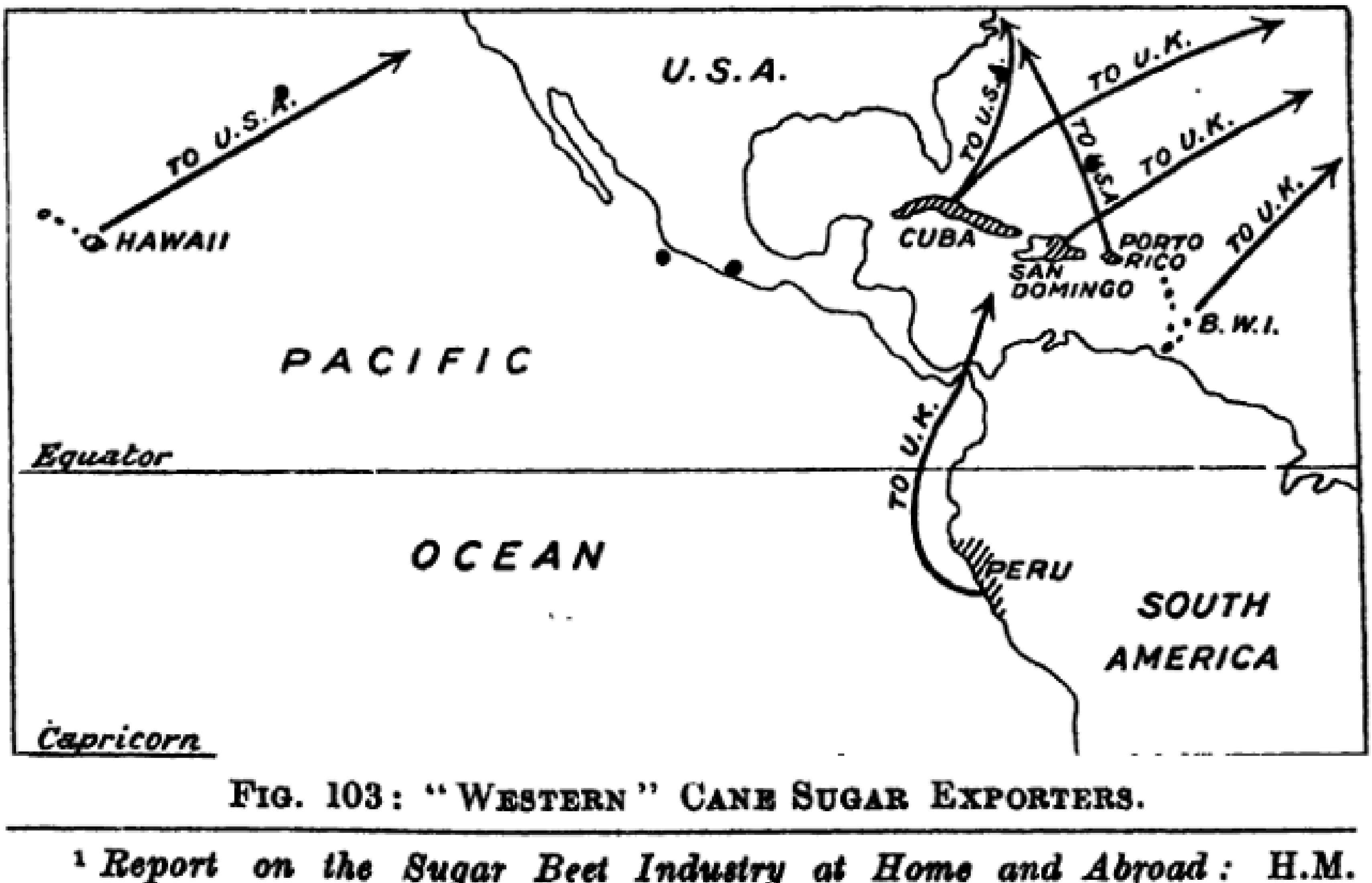


FIG. 103: "WESTERN" CANE SUGAR EXPORTERS.

---

[1] *Report on the Sugar Beet Industry at Home and Abroad:* H.M. Stationery Office.

From a study of the Table it will be seen that the commerce in sugar fluctuates considerably and this has been particularly noticeable during the "slump," partly because various remedies in such forms as voluntary and Governmental restrictions have been adopted in an effort to improve conditions in the industry.

The Table above shows that Austria has lost her export trade, which has now passed to Czechoslovakia. Germany still has an export, but it is relatively small and the quantity exported fluctuates considerably. The U.S.S.R. is sometimes an importer but more often she has a surplus available for export.

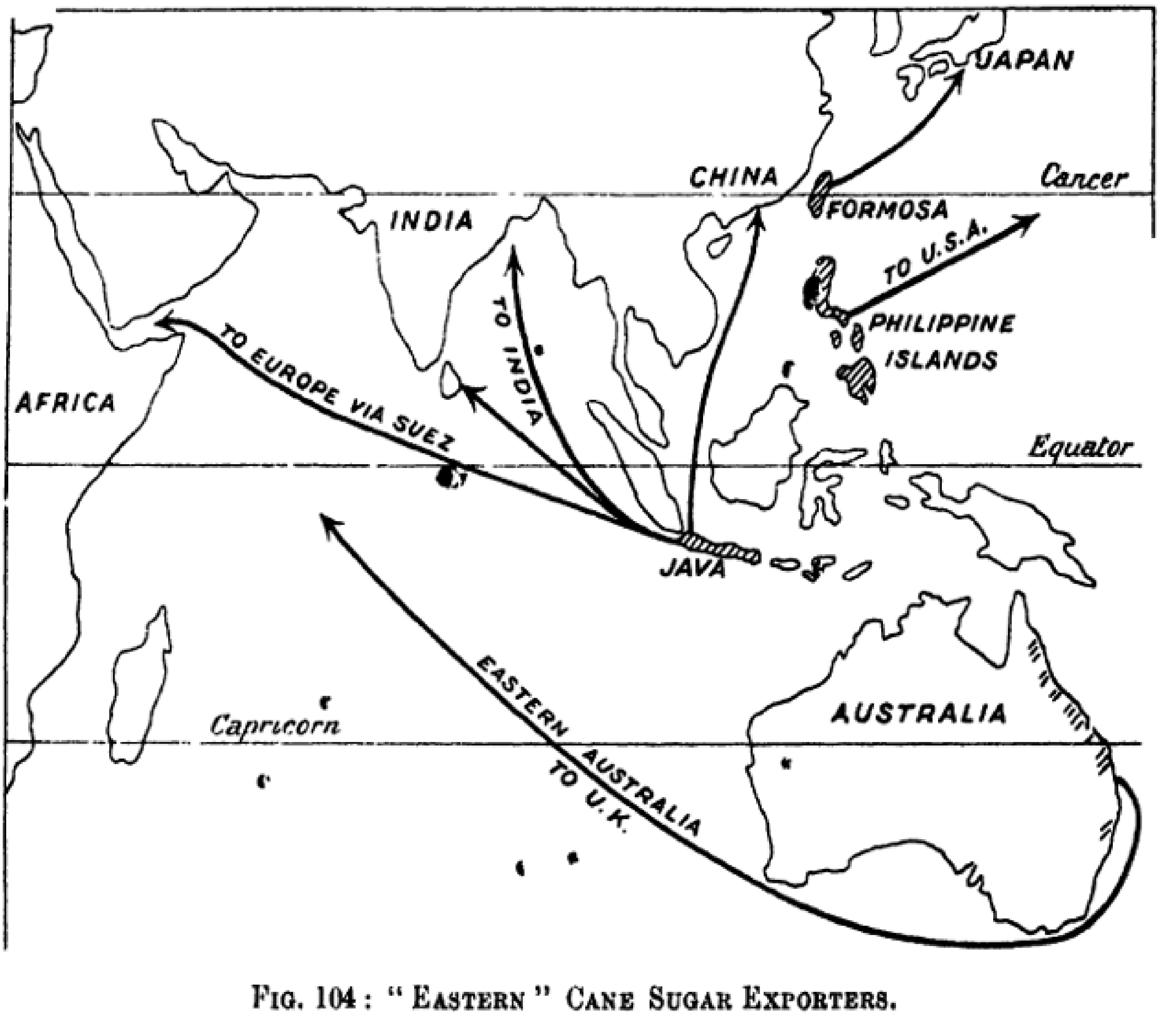


FIG. 104: "EASTERN" CANE SUGAR EXPORTERS.

The imports of sugar into the United Kingdom are obtained mainly from Cuba, San Domingo, Australia, Mauritius, Peru, South Africa, B.W.I. and Brazil. Of the total, foreign countries supply about 70 per cent. and British countries about 30 per cent. India imports from Java; the United States from Cuba, Porto Rico, the Philippines and Hawaii; and Japan from Formosa.

Before leaving the subject of sugar, we may refer to the Chadbourne Export Quota Scheme, which arose as a result of the great excess of production over demand. The scheme is an agreement between Cuba, Java, Czechoslovakia, Germany, Poland, Hungary and Belgium whereby unsold sugar is to be carried by the exporting countries and financed for five years, one-fifth to be sold each year and to be made part of the export quota. This will remove from the market about 3 million tons of the world's surplus sugar.

PULSES

Pulses are pod-fruits belonging to the order *leguminosae*, the commonest kinds being peas and beans.

Peas and Beans

PEAS are of two kinds, the garden pea and the field pea. Both kinds thrive best in the temperate zone and especially in the cooler parts of the zone. *Garden peas* are mainly used as human food, and large quantities are imported into Britain, either tinned, bottled or dried, to supplement the home-grown supply. The countries of export are New Zealand, Japan, Chile, Canada, Germany and the Netherlands. *Field peas* are mainly used as fodder and are imported into Britain from India, Holland and Germany.

BEANS are cultivated in several varieties and in diverse climates. Several varieties are grown in Britain, such as the " broad bean ", the " scarlet runner ", the " haricot ", and the " French " or " kidney bean ". *Broad beans* are imported into England in large quantities from various countries under the name of " horse beans ". *French beans* are imported from western Europe generally, especially from Rumania, Germany, France, Italy and the Netherlands. *Butter beans* come from Madagascar. The largest imports of beans are from warm temperate or tropical lands.

Other Pulses

CHICK-PEAS are particularly important in southern Europe, especially in Spain, where they are eaten by large numbers of the inhabitants, and are exported to places such as Cuba and parts of South America where Spaniards have settled. Their protein content is high, and they take the place of meat in warm countries, where little meat is eaten. They are grown also in India and northern Africa. From the former country large quantities are exported to Mauritius, Ceylon and Great Britain.

SOYA BEANS. Manchuria produces 70 per cent. of the total world production, other producers being Corea, the United States, Japan and the Netherlands East Indies. In China, Corea and Japan, where little meat is consumed, they form an important article of diet. The cultivation of soya-beans has increased to a remarkable extent in eastern Asia, the conditions favouring the growth of this plant being found especially in Manchuria. The beans can resist drought, are not injured by slight frosts, and can withstand floods such as are likely to occur in the rainy season. Apart from their value as a human food, they are useful as fodder, and are being increasingly grown in central and eastern Europe for this purpose. The crushed beans yield a valuable oil (see p. 111), and another extract, called *soya*, is much used in Britain as an ingredient in soups and sauces.

GROUND-NUTS (monkey-nuts, earth-nuts, pea-nuts or cow-peas) are cultivated for fodder and also for the oil they yield (see p. 110). They have a wide range in latitude and grow well on poor, sandy soils. India, China and West Africa have a considerable export of ground-nuts.

LENTILS are very valuable as a food plant. They are cultivated round the shores of the Mediterranean and in India. Egypt, India and France are the chief sources of British supply. Ground lentils yield a flour or meal which is of especial value as a food for invalids.

SAGO, TAPIOCA AND SPICES

Sago

Sago is a starchy substance extracted from the pith of the aerial stems of the sago-palm. It grows in abundance in the East Indies, southern China, Japan, Malaya and southern India. It is essentially a tropical plant requiring great heat and heavy rainfall, but its cultivation is very easy. It is said that a family can look after a plantation of 400 trees and that ten day's labour supplies food for one man for a year. The palm only flowers once and, just before flowering, the stems are cut and their pith is scraped and washed in order to obtain the sago. The sago of commerce is the best variety. It is exported in palm-leaf sacks from Singapore and other ports. Varieties of less value are used for food by the natives. In South America sago is obtained from certain cycads, and there is on the market German, or Potato sago, which is almost indistinguishable from real sago.

Tapioca

Tapioca or cassava (manioc—*manihot utilissima*) is a native of South America, but it is largely cultivated in both the Old and New Worlds. It is a shrubby plant which has large tubers on its roots, and from these are obtained the starch which supplies the tapioca of commerce. There are two varieties in cultivation, the sweet and the bitter, of which the latter is the more profitable. Its tubers, however, are poisonous and they must be rendered innocuous by boiling or heating. The East Indies and Malaya are the leading producers and exporters.

ARROW-ROOT is obtained from the root tubers of a plant called *maranta*. In cultivation it is much like tapioca and the chief centres of production are the West Indies and Bermuda. These two regions export the best grades, but other varieties are produced by Brazil, the East Indies and Natal. Jamaica exports the largest quantities.

Spices and Condiments

There are numerous spices on the market, the most important being pepper, ginger, cloves and cinnamon, all products of the tropical zone.

COMMON PEPPER (*piper nigrum*) is a native of south-eastern Asia. It is a climbing plant, cultivated in damp climates with a rainfall of 80 inches or over, and grown under shade. The fruit is in the form of berries which form the peppercorns of commerce. Black pepper consists of the seeds gathered and dried as they come from the tree. White pepper is made from the berries with the outer skins removed. The Straits Settlements are the chief exporters, Singapore acting as a collecting centre.

GINGER (*zingiber officinale*) is native to south-eastern Asia (India, China and Indo-China), and is largely cultivated also in Jamaica and West Africa, as well as in Japan and Fiji. Most of the British export is from India, Sierra Leone and Jamaica. The West Indian ginger has the highest value.

CLOVES (*caryophyllus aromaticus*) are the unopened buds of a small tree originally a native of the Moluccas or Spice Islands. They are cultivated in loamy soil not too near the sea, and will do well up to altitudes of about 1,500 feet. The buds are dried and smoked for export in bales. They grow all over the world in tropical regions, but the chief exporting centre is Zanzibar. Penang cloves are the best in quality. The Dutch East Indies, Mauritius and the West Indies export to a small extent.

MUSTARD, probably the most extensively used condiment in Britain, is the finely powdered seed of the plant *sinapis*, belonging to the same family as the turnip. Production is widely scattered in places experiencing a foggy climate, such as parts of western Russia, eastern England, Holland and California. An inferior quality is grown in India and exported to Britain from Bombay.

CINNAMON (*cinnamomum zeylanicum*) is an evergreen tree from whose bark the spice is obtained. It is very exacting as to soil and climate, requiring a light sandy soil, a temperature of over 85°F. and a rainfall of over 80 inches. Ceylon is the only important producer of true cinnamon, though the tree has been introduced into the East and West Indies and South America.

THE BEVERAGE CROPS

TEA

Tea (*camellia thea*) is obtained from a small evergreen shrub which is cultivated in such a manner as to produce an abundance of young shoots with very little wood. The plants are pruned at intervals of from eighteen months to four years, according to altitude above sea-level. The pruning causes them to become low bushes about three feet high with flat tops, making it easy for the labourers to pick the shoots. New shoots are constantly appearing, each series of shoots being known as a "flush". In Ceylon and Java flushing occurs all the year round, but in China and Assam, or any of the colder growing regions, the new shoots appear only in summer.

The conditions which determine successful cultivation are those of climate, soil and labour. A warm, moist and equable climate, with a temperature not less than 54°F. nor more than 80°F., is the most favourable. Regular supplies of moisture are required during the summer months, about 100 inches of rain annually being a satisfactory amount. The plant is injured by an accumulation of moisture round the roots, so that good drainage is essential and plantations are therefore usually made on hills or mountain sides. The soil should be light, rich and friable, with plenty of vegetable mould or humus. Iron in the soil appears to be beneficial, whilst a deficiency in lime has no adverse effect. The tea plant can withstand frost to a certain extent, so that it can be grown at considerable altitudes and in latitudes as far north as northern China.

Labour is an important factor in tea cultivation. Deft fingers, great patience and skill are needed in the preparation of tea for the market, so that for commercial success tea must be cultivated only in those lands which, in addition to the proper climatic and soil requirements, have also abundant cheap, skilled labour. For this reason, tea growers in the West Indies are at a serious disadvantage as compared with those in India and Ceylon, whilst other countries, such as the United States and Brazil, which have suitable climatic conditions, are for the same reason unable to produce tea on a commercial basis.

Principal Tea-Producing Regions

China, India, Ceylon, Java and Japan are the chief producers, though tea is successfully cultivated also in Nyasaland and Jamaica.

China and *Japan* have produced tea for a very long time, and it has always formed a staple article of consumption in those countries. It was introduced into Europe in the middle of the eighteenth century and from that time up to about 1850 China was the only exporting country. Since then, however, the importance of both China and Japan as exporters has been modified, and *Java* now produces more tea than Japan.

India cultivates three varieties—(*a*) China tea, the native Chinese plant of delicate flavour; (*b*) Assam tea, the plant indigenous to Assam; and (*c*) a hybrid produced by crossing the Chinese and Assam varieties—this is the kind which is most in demand at present. Assam is the outstanding producing area in India. The tea is grown on and near the hill slopes of the Brahmaputra valley, and the area extends westwards into the Darjeeling district. Tea is cultivated also in south India, on the Nilgiri Hills.

Ceylon. The rise of tea-planting in Ceylon has been one of the most remarkable of agricultural developments. In 1875 there were scarcely 1,000 acres planted with tea, but the severe attack of coffee-leaf disease which swept through Ceylon about this time caused the planters to turn to the cultivation of tea. In 1932 there were 457,000 acres under tea, and, at altitudes above 2,500 ft., it is now almost the only cultivated plant.

No production figures are available for China and Ceylon. Estimates of the Chinese output vary between 300,000 and 500,000 metric tons. In Ceylon the average yearly *export* for the years 1909–13 was 86,000 metric tons compared with an average of 104,000 metric tons for the years 1925–29. India had an average production of 127,000 metric tons for the years 1909–13 and of 199,000 metric tons for the years 1925–29. The respective figures for Java and Sumatra were 27,000 and 66,000 metric tons, and for Japan and Formosa 46,000 and 50,000 metric tons. Excluding China, world production averaged 286,000 metric tons for the years 1909–13, and 399,750 metric tons for the years 1925–29.

World production in 1932 was 449,000 metric tons and the output (in metric tons) of the leading countries (excluding China) was: India 197,000, Ceylon 115,000 (exports), Java 82,000, Japan 49,000.

Commerce in Tea

The United Kingdom imports far more tea than any other country, and London is the leading tea-market of the world. Before the War Russia was the second importing country, taking large quantities of tea in brick form overland from China, but at present her imports are much below pre-war imports. The United States rank next to Britain, and are followed by Canada, Australia and the Irish Free State. Japan and China export to the United States; the Netherlands East Indies to Australia, America and the Netherlands; while India and Ceylon provide nearly 90 per cent. of the British imports.

Commerce in Tea

AVERAGE PER YEAR IN THOUSANDS OF METRIC TONS

	Exports		
	1909–13	'25–29	1932
India	117	161	166
Ceylon	86	104	115
China	80	50	38
N.E.I.	23	60	77
Japan	18	11	13
Formosa	11	9	6

	Imports		
	1909–13	'25–29	193
U.K.	135	195	222
U.S.S.R.	71	22	16
U.S.A.	44	42	43
Canada	16	17	18
Australia	15	22	22
I.F.S.	10	11	10

COFFEE

There are two kinds of coffee in cultivation: (*a*) *Coffea arabica* (Arabian coffee), and (*b*) *Coffea liberica* (Liberian coffee). The former flourishes best at altitudes of 1,000 to 5,000 feet above sea-level, and the latter in low-lying lands. Arabian coffee is in much greater demand than Liberian coffee, and the latter is grown only in areas where it is not possible to grow the Arabian variety.

In its climatic requirements, coffee is somewhat similar to tea. It is a tropical or sub-tropical crop requiring a warm, moist climate without excessive heat, but unlike tea, it is specially susceptible to frosts. Moreover, the direct rays of the sun are injurious to the coffee plant, and it is therefore grown usually under the shade of such trees as the banana. Strong winds injure it. and if the shade-trees do not give sufficient protection, belts of trees are planted across the direction of the prevailing winds to act as wind-breaks. In Arabia the shade is provided by the mists which rise with remarkable regularity from the sea. The skill in picking which is so necessary in the case of tea is not so important on the coffee plantation, so that the cultivation of coffee is not restricted to densely populated monsoon lands. It finds its most favourable environment on the margins of the torrid zone, where the winters are comparatively frost free.

Principal Coffee-Producing Regions

AMERICA. The deforested slopes of tropical *Brazil*, especially on the volcanic soils of the State of Sao Paulo, are by far the world's most important area of cultivation, producing on the average between 65 and 70 per cent. of the world's coffee. The shade tree utilised is a tall plant of the "pea" family. *Colombia*, next in importance to Brazil as a world producer, accounts for about 13 per cent. of the world output. Other South American producers are *Venezuela*, *Ecuador* and the *Guianas*. Central America and the West Indies also are producers, particularly *Guatemala*, *Salvador*, *Mexico*, *Haiti*, *Costa Rica* and *Cuba*.

AFRICA. The most important African producers are *Angola*, *French Somaliland*, *Kenya*, *Tanganyika*, *Madagascar* and *Uganda*. The Liberian variety is cultivated in West Africa.

ASIA. The *Netherlands East Indies* are third in importance of the coffee producing regions, the output averaging about 4 per cent. of the world total. Java is the principal producer. *India* has plantations in Mysore in the south of the Deccan. *Arabian* (Yemen) coffee, the celebrated Mocha coffee, is of the finest quality, but the export is small. *Ceylon* was formerly a leading producer, but the industry has been ruined by the fatal coffee-leaf disease, in spite of scientific research and hybridisation in an effort to find disease-resisting varieties.

Commerce in Coffee

As the Table below reveals, Brazil is by far the largest exporter of coffee, but during the last few years she has lost some of her trade, particularly that to the United States, to Colombia. Whereas Brazil formerly supplied 85 per cent. of the coffee imports into the United States, her share is now only 45 per cent. As a consequence there is a tendency to increase the cultivation of other crops at the expense of coffee and the Government has even forbidden the plantation of further coffee plants for the time being. Comparatively little coffee is imported by Great Britain as the British are drinkers of tea rather than of coffee.

Commerce in Coffee

AVERAGE PER YEAR IN THOUSANDS OF METRIC TONS

Exports					*Imports*				
1909–13			'25–29	1932	1909–13			'25–29	1932
Brazil	759	Brazil	886	716	U.S.A.	389	U.S.A.	637	673
Venezuela	51	Colombia	149	191	Germany	181	France	163	187
Colombia	46	N.E.I.	83	113	France	111	Germany	120	130
Guatemala	39	Venezuela	54	49	Austria	59	Italy	45	41
Haiti	35	Guatemala	46	36	Netherlands	43	Sweden	41	38
Salvador	29	Salvador	43	40	Belgium	35	Belgium	40	49
N.E.I.	22	Haiti	33	23	Sweden	34	Netherlands	35	38
Mexico	22	Mexico	20	20	Italy	26	Denmark	25	25

COCOA OR CACAO

Cocoa is made from the beans of the cacao tree (*theobroma cacao*), which grows to a height of from 12 to 25 feet and bears its pods on very short branches produced on the old and thick stems. Cocoa is essentially a product of the hot, equatorial lowlands, and outside the equatorial belt of calms it will thrive only in hot, sheltered valleys. Its distribution is consequently more limited than that of either coffee or tea. The climatic requirements are a uniformly high temperature, a damp atmosphere, and an abundance of rain evenly distributed throughout the year. Cacao trees should in general be cultivated under shade trees, chiefly to protect them against the wind, but also to shelter them from the direct rays of the sun. Here again the natural tendency is to use some other commercial plant as a shade tree, such as the rubber or banana. Climates favouring the cultivation of cocoa are not suited to white labour.

Principal Cocoa-Producing Regions

The most remarkable feature in connection with cocoa production is the rapid increase in the amount produced by the *Gold Coast*, which now provides almost half the world's supply. Having equal facilities with other producing countries as regards climate and soil, it has outstripped its competitors by its more skilful exploitation of the land,

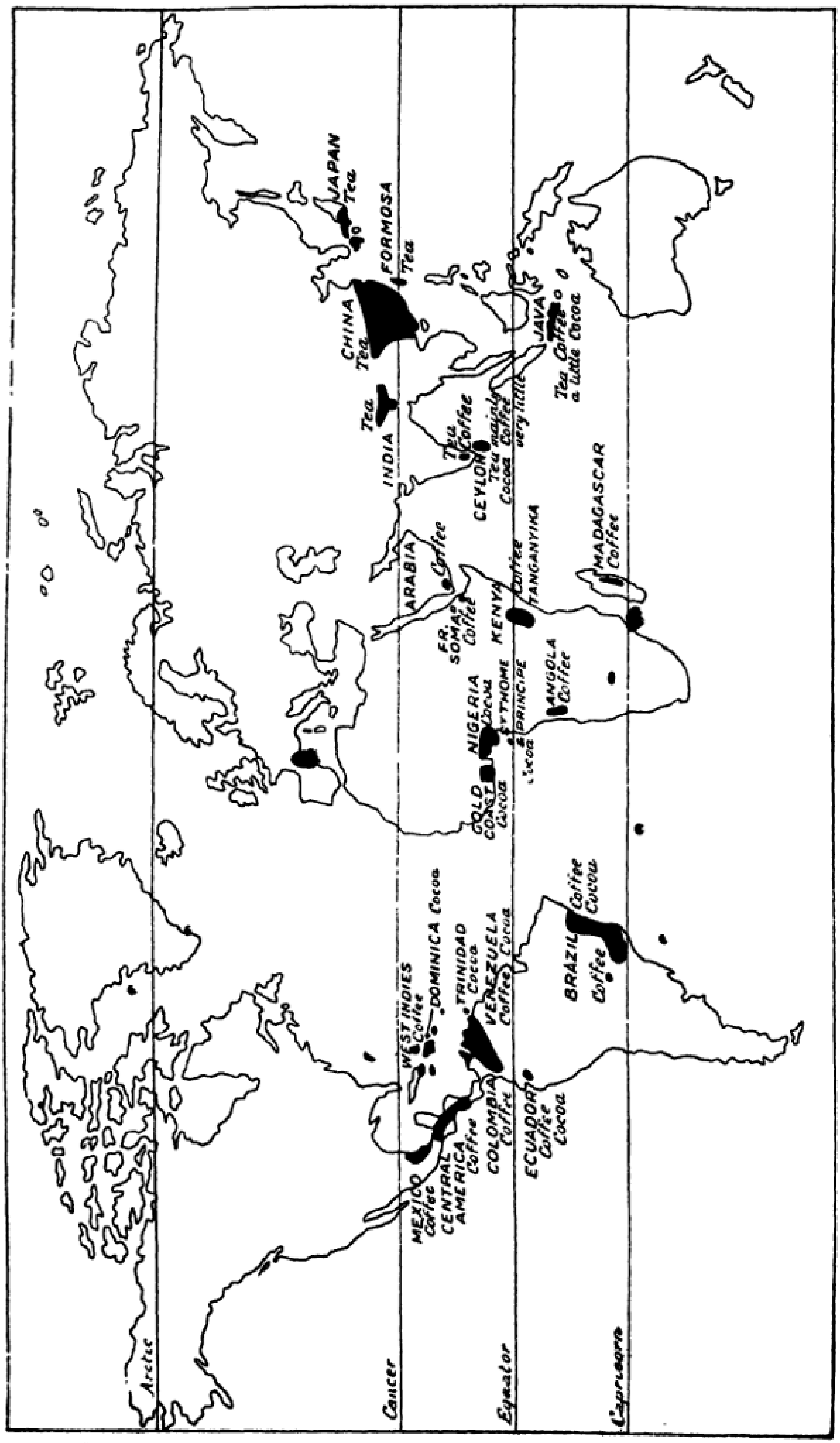


FIG. 105: DISTRIBUTION OF TEA, COFFEE AND COCOA.

Note the tropical limits of cocoa and coffee and the wider latitudinal range of tea in eastern Asia.

by experienced administration on the part of white men, and by keeping cacao as the only important money crop. Other factors are that the Gold Coast lies on an old-established shipping route, and that the development of railways and roads has made communication between the plantations and the ports very much superior to those existing in the older producing countries, such as Ecuador.

As in the case of Brazilian coffee, however, there is some danger of over-production. The average yearly export of the Gold Coast for the years 1909–13 was 35,000 metric tons, and the average world output was 236,000 metric tons. For 1925–29 the average Gold Coast export had risen to 228,000 metric tons out of an average world output of about 520,000 metric tons. In 1932 production was still higher at 245,000 metric tons out of a world total of 615,000 metric tons.

Apart from the Gold Coast, the chief producers, in decreasing order of importance, are *Brazil*, *Nigeria*, *Trinidad*, *Ecuador*, *Dominica*, *Venezuela* and *Sao Thomé* and *Principé*. The last two are small islands in the Gulf of Guinea not far from the Gold Coast. Prior to 1914 Ecuador, Sao Thomé and Principé together produced as much cocoa as the Gold Coast, but their output has since declined and is now only about half the pre-war production. The Cameroons are becoming one of the chief African producers.

Commerce in Cocoa

The producing countries named above are all exporters. The leading consuming countries are the United States, Germany, Great Britain, the Netherlands and France. The United States buy from South America. Great Britain imports from West Africa and the West Indies. The War was responsible for a marked increase in the consumption of chocolate and cocoa, and this increase has so far shown no signs of diminishing. In the Table below it will be seen that the marked change in the relative importance of the principal exporting countries (which, in the case of cocoa, are the principal producers) are not reflected by any similar changes in the relative positions of the importing countries.

Commerce in Cocoa

AVERAGE PER YEAR IN THOUSANDS OF METRIC TONS

Exports					*Imports*				
1909–13			'25–29	1932	1909–13			'25–29	1932
Ecuador ...	37	Gold Coast ...	228	237	U.S.A. ...	59	U.S.A. ...	186	214
Gold Coast ...	35	Brazil ...	68	98	Germany ...	48	Germany ...	74	79
S. Thomé & Principé ...	35	Nigeria ...	45	69	U.K. ...	27	U.K. ...	58	71
Brazil ...	31	Ecuador ...	24	15	France ...	26	Netherlands	46	40
Trinidad ...	19	Dominica ...	22	17	Netherlands	25	France ...	37	44
Dominica ...	18	Trinidad ...	21	26					
Venezuela ...	16	Venezuela ...	19	16					
Nigeria ...	3	S. Thomé & Principé ...	16	14					

HOPS

The hop plant is a slender-stemmed, twining, climbing plant (*numulus*) cultivated for its clusters of creamy-green flowers which are used as a seasoning for beer. It is a very exhausting crop, needing very rich soil and protected situations. It is thus confined to those few localities which have the necessary climatic and other essentials.

In *Britain*, the Weald of Kent and Sussex are important growing areas, but the best quality comes from near Farnham in Surrey, where the soil of the upper greensand outcrops is specially suitable for hop cultivation. Hops are grown also in Hereford, Hampshire and Worcestershire. England produces all but about one-seventh of her requirements, the balance being imported mainly from Europe and the United States. In *Germany*, hops are grown in Bavaria, particularly in the division of Middle Franconia in W. Bavaria, north of the Danube, and despite the large beer industries of that country there has been a surplus available for export in recent years. *Alsace Lorraine* has commenced to grow hops on an extensive scale. *Czechoslovakia* also produces hops, particularly in Bohemia, and exports about two-thirds of her production. The *United States* is the largest producer and has a surplus available for export, although this may disappear with the repeal of prohibition.

FRUITS AND OILS

FRUITS

Fruits are much more important commodities of commerce than they were many years ago. The invention of refrigeration and the great developments in canning and preserving have caused a world-wide trade in fruits of all kinds, and thanks to this and the different times of ripening in various parts of the world, fruit is now an all-the-year-round commodity.

Cool Temperate Zone Fruits

Cool temperate zone fruits, mainly deciduous in type, are the seed-vessels of various kinds of trees, and among the most important are *apples*, *pears*, *plums*, *cherries*, *gooseberries*, *currants* and *strawberries*. The principal producing regions are Western Europe (including the British Isles) and North America—in the western marginal lands from British Columbia to California, in the Lake Peninsula of Ontario, in Nova Scotia and in the north-west of the United States. Large quantities, particularly of apples, are grown in England, but still more are imported. Canada, the United States, Tasmania, Australia and New Zealand all take an important share in the cool temperate fruit trade.

Warm Temperate Zone Fruits

These fruits are those mainly cultivated in Mediterranean countries, and include (*a*) peaches, nectarines, apricots, figs and almonds ; (*b*) citrus fruits ; and (*c*) grapes.

THE CITRUS FRUITS are valuable not merely for their juices and luscious flavour, but also because they contain certain elements which have been found to be essential for perfect health. In fact it was the use of lime juice and green vegetables which enabled Captain Cook to make his world voyages without being troubled by that terrible skin disease—scurvy, which was common amongst sailors of those days.

Foremost amongst citrus fruits is the *orange*, brought originally from China and introduced in the Middle Ages into Mediterranean lands, where it is specially important in Spain, Italy (particularly Sicily) and Algeria. From here it has spread to California and Florida, each of which now produces about 20 to 30 millions of boxes every year. The orange is being produced also in the " Mediterranean " areas of South Africa and Australia, and in the West Indies and southern Brazil. The marmalade orange is chiefly grown round Seville (Spain), though other species of bitter orange are also on the market.

The *lemon* will grow where oranges flourish, but Sicily has almost a monopoly of the trade. The *lime* is mainly produced by the West Indies (Montserrat). The *grape fruit*, or *pomelo*, has become of great importance in commerce and is produced in California. Florida, South Africa and, more recently, in the Entre Rios district of Argentina.

GRAPES are produced wherever the vine can be grown. Those varieties which are not suited for wine-making enter into commerce as fresh fruits, or as dried fruits in the form of raisins and " currants " (which are not really currants at all). *Raisins* are grown mainly in the United States, Turkey, Greece, Australia and Spain. *Sultana raisins* are made from a dried seedless grape cultivated in Asia Minor. *Currants* are the dried form of a small seedless grape which is peculiarly restricted as regards area of cultivation. It appears to be most exacting in its requirements of soil and climate, and is practically confined to Greece, where it is grown mainly on the islands and along the south shore of the Gulf of Corinth. The chief exporters of *table grapes* are Spain, Italy, Hungary, Algeria and the United States.

WINE. It is as a wine-producer that the grape is most important, and, because of its response to geographical environment, it is one of the most interesting of all economic plants. The climatic requirements of the vine are rather rigorous. There must be plenty of sunshine, not too much moisture and a long summer with a fairly high temperature extending into the autumn—in Europe a temperature of 60°F. in September is an essential condition.

This last condition sets a northern limit to vine culture. In Western Europe the limit is about the mouth of the Loire (lat. 47½°N.), but going eastwards the line bends northwards until in Poland it is at lat. 53°N. From here it turns southward again to the Sea of Azov and, rising slightly in S.E. Russia, it turns again southward to lat. 40°N. or 41°N. in Asia.

The vine has a very long root, and this assists it to obtain moisture from great depths, so that it will flourish in regions of almost rainless summer when other vegetation has ceased growing. Soil conditions also are important. The soil should be warm, and capable of retaining moisture without being actually wet. This condition renders chalk and limestone areas extremely suitable (*e.g.*, Champagne and Burgundy). Furthermore, great skill and expensive appliances are necessary in the industry, which can be practised only on a large scale and where there is abundant capital and labour. The vine is, therefore, a product of densely populated regions and is seldom found near frontiers. Moreover, the localities in which the industry has already been carried on for a long time have so great an advantage in their established reputations and the highly developed skill of their people, that it has hitherto been found difficult successfully to introduce wine production into new regions. Nevertheless, certain British Dominions, *e.g.*, Australia and South Africa, have in recent years made remarkable strides in the development of viticulture and now produce wines of considerable variety and of good standard.

The vine is liable to several peculiar diseases, some of which have caused considerable trouble at various times. A certain fungus in the nineteenth century destroyed vineyards in Mediterranean countries and wrought great havoc in the world-famed vineyards of Madeira. From about 1865-1885, the well-known *phylloxera* attacked the roots of vines in some parts of Europe, particularly France, and by 1885 some 2,000,000 acres had been destroyed. This terrible evil was remedied by grafting French vines on to American root stocks, which are immune from *phylloxera*, and, as a result, France has since recovered much of the ground lost from the effects of the disease, though the acreage under vines is still much less than it was in 1875. In that year there were 5,980,000 acres under vines, whereas now there are about 4,000,000 acres.

France is the principal wine-producing country as regards both quantity and quality. The most celebrated wines are (*a*) "Clarets" or Bordeaux wines from the basin of the Gironde estuary; (*b*) "Champagne" from the chalk hills of the region of Champagne, round Epernay and Reims; and (*c*) "Burgundy" from the slopes of the Côte d'Or overlooking the Saône Valley (Maçon Beaune). The "Moselle" wines are now grown in French territory. In spite of the large production, France has to import large quantities of wine for her own consumption, chiefly from *Algeria*, which is fourth in importance of the wine-producing countries.

Spain has some very high quality wines, the most important being "sherry" from the town of Jerez near Cadiz, and wines of a "port" type from Barcelona and Tarragona. Spain follows France and Italy as a producer of wine and is second to Algeria as a wine-exporter.

Portugal produces the famous "port" wine, produced in the Douro valley and exported from Oporto. *Italy*, second in importance to

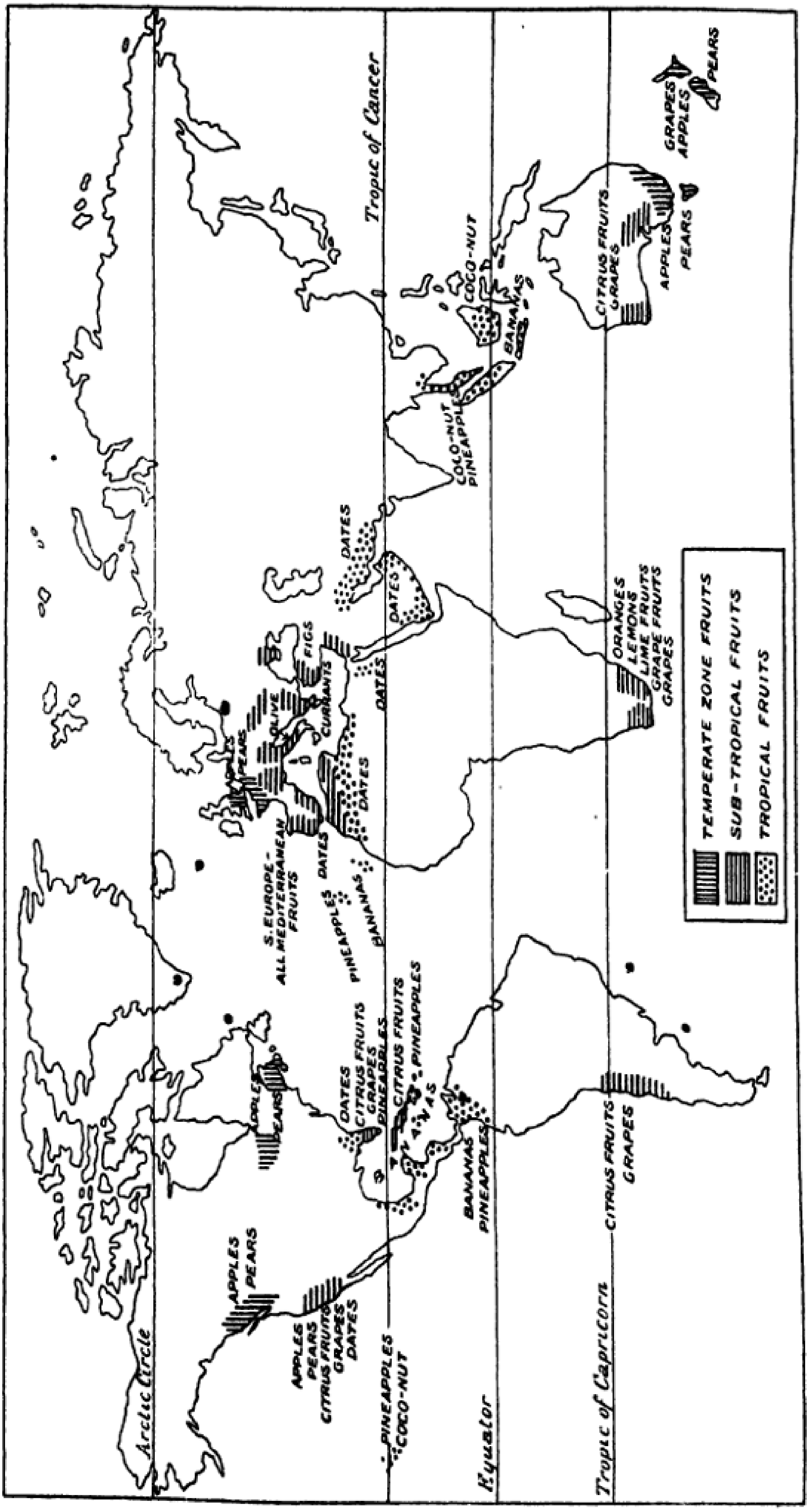


FIG. 106: DISTRIBUTION OF FRUIT PRODUCTION.
The countries should be identified by reference to previous figures or to an atlas.

France as a wine-producer, has a large consumption and little is exported. *Hungary* ("Tokay"), *Greece*, *Germany* ("Rhine" wines), *Rumania*, *Yugoslavia* and *Bulgaria* are other European producers, Greece, Hungary and Yugoslavia having a net export.

Outside Europe, wine manufacture is far behind that of France, Italy and Spain. The *Argentine* follows these three countries and Algeria in importance, and its production of wine is increasing, although as yet there is no surplus for export. Other producers are *Chile*, *Brazil*, *Tunisia*, the *Cape of Good Hope* and *Australia*. The output of Brazil is insufficient for home consumption, but the remaining countries have an export, Tunisia being the most important in this respect.

Tropical Fruits

THE BANANA is easily the most outstanding of commercial fruits from the tropics, where it is not only widely used as food but also widely exported. It grows in deep soil and requires a high temperature with a great deal of moisture. Bananas, once a luxury, are now in wide demand, despite the fact that their nutritive value is small. They form the basis of a very large trade between the producing countries and the countries of Europe and the United States. The banana industry owes its development largely to the advance of science, which has eradicated tropical diseases and established efficient sanitary schemes, and to the development of refrigeration. Capital has been forthcoming on a large scale to foster the industry, which at the present time is highly organised.

The chief producing centres are the islands and republics of the Caribbean (owing to the ease of access to the United States and to Europe), the Canaries and Formosa. The leading exporters, in order of importance, are the *Canaries*, *Guatemala*, *Colombia*, *Formosa*, *Costa Rica* and *Panama*. Japan takes the whole of the exports from Formosa, whilst the Canaries export mainly to Europe. The bananas are picked when green and ripen *en route* or are left to ripen in the country of destination. Regular express liners, specially equipped, ply between the Caribbean ports and New York, New Orleans, Philadelphia, Bristol, Liverpool, London and Newcastle. A trade is also developing in sun-dried bananas, especially in countries of the Pacific and Indian Oceans, while a still further development is the marketing of banana pulp in tins and of banana flour.

THE PINEAPPLE is a fruit which occurs in many varieties, the largest being the one mostly cultivated in Ceylon, where it has reached a weight of over 20 lbs. The plant needs a rich, moist soil and considerable heat, and under proper conditions yields two crops a year. Light soils, preferably sandy, are most favourable, and proximity to the sea is advantageous.

The pineapple is cultivated in the *West Indies*, *Bermuda*, the *Azores*, *Hawaii*, *Madeira*, the *Canaries*, the *Malay States* and other tropical countries, and is exported mainly as tinned or canned fruit. The United States draws its supplies largely from Florida, Cuba and Hawaii, whilst Europe imports from the Azores and the Canaries. An extensive trade in tinned pineapple is carried on from Singapore, mainly by Chinese.

DATES are the fruit of the date palm, and form the staple food in parts of northern Africa and south-eastern Asia. The tree requires great heat and considerable moisture, the latter of which it obtains from deep down in the earth through the agency of its long roots. As the date palm will thrive under most arid conditions, it is the typical plant of desert oases, and it is for this reason that the date is frequently described as "the food of the desert." In *California* and in *Florida*, many streets are lined with date palms, while the huertas of Madeira in *Spain* are famous for their dates, a grove of which was planted at Elche by the Moors. The fruit is exported mainly from *Persia*, *Iraq*, *Oman*, *Syria*, *Egypt*, *Algeria*, *Morocco* and *Tunis* and the principal export centre is Basra, which collects the produce from the various countries round the Persian Gulf.

VEGETABLE OILS

The number of vegetable oils is very large, but only a few are sufficiently important to be mentioned amongst food-stuffs.

OLIVE OIL is by far the most important of the foodstuff oils. The olive tree is usually regarded as the typical Mediterranean tree because the Mediterranean type of climate suits it so well, and because it is found throughout the Mediterranean region, except in Egypt. In these countries olive oil is largely used in place of the edible fats because the climate is too dry for dairy cattle. *Spain* has forests of olive trees in Andalusia, while *Italy* also has large numbers. In *France* the olive is grown in the lower Rhône valley from Avignon southwards, and though the production is small, the trees are more carefully cultivated than in other countries, so that the olive oil of Provence is the first in quality. Cultivation has increased considerably in the south of the *Crimea*, in *Asia Minor* and in *Tunisia*, where fine quality oil is exported from Sfax.

In those parts of the world outside the actual Mediterranean region, but experiencing the same type of climate, olives have been introduced with success, as, for example, in *California* and *South Australia.*

France produces the finest quality of olive oil, but some Italian oils, notably those of Lucca and Liguria, are almost as good. Spain, Greece, Tunisia, Algeria and Italy are the chief exporters. Italy exports most of her oil to Argentina and France, although some goes to the United States. The production in France is insufficient for home needs, large quantities being imported from North Africa. Britain obtains olive oil from Spain, Italy, France, Greece, Turkey and North Africa.

Cotton-seed Oil is being used in increasing quantities as a substitute for olive oil, and in this connection an important cotton-oil refining industry has been established at Hull. The seeds come mainly from *Egypt*, the *Anglo-Egyptian Sudan* and *Uganda*. The large export formerly obtained from India has almost ceased. Cotton-seed oil is used also with beef products in the manufacture of compound lard, and other uses are found for it in the making of soap, candles and similar articles, and in frying fish.

Ground-nut Oil from ground nuts (see p. 96) is used in much the same way and for similar purposes as olive oil, but its future importance lies in its utilization in Diesel-oil engines, rather than as a food oil. This use of the oil is likely to have a far-reaching economic effect, since it allows of the erection of Diesel-oil plant in regions where ground-nuts will grow but which are without supplies of petroleum.

Nearly 50 per cent. of the total world export of ground-nuts comes from *India*. *Senegal*, *Nigeria* and *China* are next in importance, and nearly all the remaining tropical West African countries are exporters. France and Germany are the principal importers and France, China and the Netherlands are the only important exporters of ground-nut oil, whilst Algeria is the largest importer. Britain imports both the nuts and the oil.

Palm Oil. The oil palm, which grows in great profusion in the forests of *West Africa*, from Sierra Leone to the French Congo, yields a fruit which provides palm oil and palm kernels, both of which are exported in enormous quantities from British, French and Portuguese West Africa, the principal producer being Nigeria. There is also a large export from the Netherlands East Indies.

The palm oil, made from the fruit pulp, is used largely in the manufacture of soap and candles, as a lubricant for the axles of railway rolling stock, and as a flux in making tin plate (*e.g.*, in South Wales), while palm kernel oil is an important constituent of margarine. The oil is imported chiefly by the United States, followed by Britain and Italy.

Coconut Oil is obtained from the kernels of the coconut, the fruit of the coconut palm and a product of tropical islands and coastlands. Ceylon, the East Indies, and the Pacific Islands are the principal coconut-producing regions, the leading producers being *Malaya*, the *Philippines*, *Ceylon*, the *Netherlands East Indies* (N.E.I.) and such island groups as *Fiji*. The dried kernel or flesh of the nut is known as "copra", and the extracted oil is used extensively in the manufacture of margarine, soap and candles. Flaked or powdered kernel is known as "desiccated coconut" and is used in confectionery. Coir, a valuable fibre used for the manufacture of matting, is obtained from the outer covering of the coconut.

The chief exporters of copra are the *N.E.I.*, the *Pacific Islands*, the *Philippines*, *Malaya*, *New Guinea* and *Ceylon*, while the chief exporters of coconut oil are the *Philippines*, *Ceylon*, the *Netherlands* and *Germany*.

The leading importers of copra are the *United States*, *Germany*, *France*, the *Netherlands*, *Denmark*, the *United Kingdom*, *Italy*. and of coconut oil the *United States* and the *United Kingdom*.

SOYA OIL, used in the manufacture of soap, soups and sauces, is obtained from the soya bean. Manchuria is the leading exporter. Germany and Denmark export soya oil made from imported beans and Japan also has an export of the oil. Great Britain, Sweden and the Netherlands are the chief importers.

QUESTIONS ON CHAPTERS 10 AND 11

1. Give an account of the geographical conditions necessary for the large-scale production of wheat, and show how far these requirements are satisfied in the principal areas where the crop is grown for export. (*I. of B., Pt. I*, 1931)
2. Give an account of the fruit trade of the British Empire. (*L.C. of C., Junr.*, 1931)
3. Of the commodities printed below give in turn a brief account of our main sources of supply, home, colonial, or foreign, with reasons why we obtain them from the sources mentioned. *Sugar, bacon, mutton.* (*S.A.A. Prelim., May*, 1929)
4. An English breakfast usually consists of a beverage of some sort, a cereal perhaps, followed by fish, or eggs, or something obtained from a pig, with bread or toast and a little jam, or marmalade, or some form of sweet to end up with. From the foregoing choose your own bill of fare, and state from what parts of the world each item of your meal may have come. (*S.A.A. Prelim., Nov.*, 1929)
5. What conditions favour the growth of cotton, rice and tea? From what parts of the world are these products imported by Great Britain? (*C.I.S. Prelim., June*, 1929)
6. Where are the vine-growing districts of the British Empire? Describe and account for their characteristic climate. What other crops flourish in these regions? (*C.I.S. Prelim., June*, 1930)
7. State and account for the sources (excluding N. America) from which the United Kingdom imports its chief supplies of meat. (*I.S.A. Prelim., June*, 1931)
8. It is said that the British Empire could provide itself entirely with raw wool, raw cotton, and wheat. Show briefly, by reference to climatic maps in particular, why this might be made possible; and show also what headway has already been made in the production of these three commodities. (*I. of B., Qual.*, 1931)
9. Where, within the British Empire, is coffee grown? What are the main factors determining its supply? (*I. of B., Qual.*, 1930)
10. From what parts of the British Empire does Great Britain get her main supplies of vegetable oils? In what industries are they important, and what are the difficulties involved in their supply? (*I. of B., Qual.*, 1928)

11. From what parts of the Empire can the people of London obtain Imperial supplies in place of Argentine beef, Danish butter, American cotton, Californian plums, Spanish oranges? (*L.C. of C., Junr.*, 1928)

12. Tabulate the principal areas from which the undernoted are obtained and indicate the special facilities required for carrying on a large trade in each of them :—Wheat ; Maize ; Salmon ; Beef. (*C.I.I. Associateship, Accident Branch*, 1931)

13. State the parts of the British Empire from which we obtain the undernoted and the climatic conditions necessary for their production :—Jute ; Sugar ; Wool ; Tea. (*C.I.I. Associateship, Accident Branch*, 1931)

14. For each of the following products name a region overseas from which we obtain large supplies : Beef, mutton, sugar, palm-oil, rice, tea. Describe the conditions which favour the production of any *one* of these articles. (*C.S., Feb.*, 1929)

15. For each of the following articles name a region from which we obtain large supplies, and point out how its production is helped by the climate and other local conditions :—coffee, cacao, raisins. (*C.S., Feb.*, 1930)

16. Name TWO important food-stuffs which are produced in the British Isles but not in sufficient quantities to supply our needs. State the chief parts of the world from which we obtain additional supplies, and explain how it is that the exporting countries have a surplus of the particular commodity and why home production is not greater than it is. (*C.S., March*, 1928)

17. Tea, flax fibre, wine, and silk are commodities which can be produced within a wide range of climate, and yet show well-marked localisation so far as large-scale production for export is concerned. Indicate, by reference to the main areas of production, the reasons for this localisation in each case. (*C.S., Oct.*, 1928)

18. The climate of a region is the main factor that determines the kind of vegetable products that can be produced. Illustrate the truth of this statement by considering the production of wine, rice, and wheat : in each case name a country where its production is important, and show in what way the conditions of climate are favourable. (*C.S., August*, 1931)

19. Discuss the following industries, noting specially the climatic and labour conditions :—(*a*) Wheat farming in Canada, (*b*) Cattle ranching in Argentina. (*L.M., Jan.*, 1931)

20. Whereabouts in the northern hemisphere are there extensive fishing grounds? Describe the geographical conditions that they have in common. (*L.G.S.*, 1928)

21. State the geographical conditions favouring the successful growth of *two* cereal crops other than wheat. In each case locate the chief areas of production. (*N.U.*, 1929)

22. Locate the chief wheat growing areas of the British Empire. How far do geographical conditions influence the location of these areas? (*L.M., Jan.*, 1934)

CHAPTER 12

SOURCES OF POWER

EVERY member of a civilized community directly or indirectly uses power derived from sources other than his own muscles or those of his fellow men. The time, labour and expense saved by the use of the energy of inanimate nature has made possible the development of great industries, and has opened up regions of the world whose resources could otherwise never have been tapped. The possession of power resources is thus a fundamental factor in the prosperity of a country, and it is for this reason that, as the existing sources show signs of becoming exhausted, the energies of nations are always directed to finding still newer and cheaper sources of power.

In many regions, the muscular strength of human beings and of animals is still a major source of the total power used, and we may therefore tabulate the sources of energy as follows :—

1. ANIMALS :
    - (a) Man.
    - (b) Other animals, such as the horse, donkey, mule, ox, camel, elephant, yak, llama, reindeer and dog.
2. WIND :
    - (a) In windmills.
    - (b) As a motive power for carts, wheelbarrows and ships.
3. WATER :
    - (a) Directly to turn a millwheel.
    - (b) To turn a turbine and thus generate electricity.
4. FUELS :
    - (a) Wood.
    - (b) Peat.
    - (c) Coal (including lignite) and products.
    - (d) Petroleum and its products.
    - (e) Alcohol.
5. SOLAR HEAT.

Not all these sources of power can be used everywhere—geographical factors are important in this respect. In tropical countries man's strength is the principal source of power, and in India, China, Africa and tropical America long lines of coolies may be seen trudging hundreds of miles with heavy loads on their backs. Animals are little used in these countries because the natives are neither sufficiently energetic nor sufficiently intelligent to take care of their animals, although a more important reason is that the most useful animals do not, as a rule, thrive in such countries.

Windmills are unknown in the tropics, except where white men have introduced them, and this despite the fact that the gentle, regular Trade winds would be ideal for wind-power. Here again the cause lies in the lack of energy and inventive power of the native races which inhabit these areas.

The application of other sources of power—such as coal, wood and oil—presupposes even greater inventiveness and mechanical skill, and it is for this reason that the greatest application of power is to be found in the temperate zone, where the geographical conditions have produced the most energetic and intelligent races of the world. In view of this fact it is, of course, fortunate that the most abundant and easily accessible supplies of coal (at present the most important source of power) occur in the temperate zone.

Geographical conditions help to determine which source of power shall be used. For example, at Dannemora, in Sweden, where the surrounding forests provide abundant wood, but where there is no coal, wood is converted into charcoal to smelt iron ore. Incidentally, some of the finest grades of tool steel can be made only with charcoal.

Again, some countries with abundant coal resources use practically no coal as a source of power. The countries of Western Europe and the United States of America use coal to a very large extent, mainly because these countries have energetic populations with alert, active minds. On the other hand, China, Indo-China and Siberia have vast coal resources which are almost unused, either because geographical conditions in those countries have kept their peoples backward or because, as in the case of Siberia, the conditions are adverse to human existence and the population is scanty.

Eventually, of course, the continued use of the mineral fuels as sources of power must end in their complete exhaustion, for the world's mineral supplies are not being renewed as are its animal life and vegetable life. Even wood, the supply of which might be maintained by eliminating wasteful use and by adequate re-afforestation, is being used up at an alarming rate. As a result of this the cost of the various sources of power must increase to such an extent as to compel man eventually to search for and use other less expensive sources in order to keep down the cost of production of his manufactures. The energy of falling water, a source of power which is cheap and permanent (though sometimes seasonal), is one of the most promising of these alternatives. The direct heat of the sun has also been used, while even the energy now wastefully dispersed by the tides has been the subject of experiment.

COAL

Coal, the most important source of power, is a combustible mineral of vegetable origin. As the vegetation of past ages died, it collected in hollowed-out parts of the earth's surface—frequently swamps—and was afterwards covered with mud and other deposits, probably as a result of earth movements. Gradually, this mass of decaying vegetation became hardened and at the same time lost the greater part of its content of oxygen, hydrogen and nitrogen, leaving carbon as the dominant constituent.

Coal occurs only in sedimentary rocks, and the most important period of its formation is that known as the Carboniferous period. The mineral when found does not usually occur in level bands or beds, as it must originally have been formed, but it lies in irregular layers of varying thickness. This irregularity is a result of earth movements, whereby the earth's crust has been folded and faulted, contorting the coal seams and the surrounding rocks and even crushing and powdering the coal in places. These movements have also caused large areas of coal-bearing rocks to lie at considerable depths below the surface and in such cases the cost of working the seams is prohibitive. Where the coal lies near the surface and in more or less level bands, it is naturally easier and less costly to work. The working of coal is also unprofitable where the seams are " thin ", *i.e.*, less than one foot in thickness.

Coal varies in quality according to the percentage of carbon which it contains. The principal classes of coal are (1) Lignite ; (2) Bituminous coal ; (3) Anthracite, and (4) Cannel.

LIGNITE, or BROWN COAL, is " young " coal in which traces of the original vegetable matter can still be found. It contains only 67 per cent. of carbon and provides relatively little heat. Lignite usually contains much moisture which, on drying, causes the coal to break into small pieces, and, when burnt, this coal leaves a great deal of ash.

BITUMINOUS COAL is the most widely used variety both for household purposes and in manufacture. It contains about 85 per cent. of carbon and only 10 per cent. of ash. Included in this class are two highly important varieties : (*a*) " coking " coal, *i.e.*, coal which can easily be converted into coke, and (*b*) " steam " coal, which, as its name implies, is the most suitable type for raising steam.

ANTHRACITE is hard, dense, bright coal containing the highest proportion—90 per cent.—of carbon. The small quantity of volatile matter contained in anthracite makes it difficult to ignite. It burns very slowly but provides an intense heat with little flame or smoke. This type of coal is useless for coking purposes but is of value for ships' engines and metallurgical purposes, whilst its use as a household fuel is increasing, particularly in connection with slow combustion stoves for heating water. South Wales and Pennsylvania (U.S.A.) are famous for their deposits of anthracite.

CANNEL COAL is mainly used in the manufacture of coal gas. It is hard, lustrous and compact and when burning gives off a long, smoky flame.

World Reserves of Coal

The world is using up its coal at a rapid and wasteful rate, despite the fact that no other fuel has yet been found which can fully take its place. Peat, which represents the intermediate stage between vegetable matter and coal, might be used as fuel, but the world's supply of peat is estimated at 13,000,000,000 tons, and, if substituted for coal, it would not last more than seven years. If wood were used, the supply would be exhausted almost as quickly. The United States use about 500,000,000 tons of coal per year. To obtain the same amount of power from wood, 1,500 million tons would be required, that is, nearly four times as much as the entire amount of wood already used for fuel and lumber.

In view of these facts there is everything to be said for the elimination of the wasteful uses to which coal is now put. Fortunately, the position has been realized and methods of conservation are being applied in various ways. One method is to use the coal to produce electricity at the mines and to transmit the energy by cable to the factories and industrial centres. This method has all the advantages of economy by specialisation and concentration, while it results also in the saving of the enormous amount of coal which is consumed by freight trains in the distribution of coal to factories and centres of population. Another method of eliminating waste is to extract oil and gas from the coal and to use them in internal combustion engines, which are more efficient than steam engines.

The coal reserves of the world are estimated as follows (in millions of metric tons): Asia, 1,300,000 (mainly in China and India); North America, 5,073,000; Europe, 784,200; Australasia, 166,000 (165,000 in Australia); Africa, 58,000 (56,000 in the Union); South America, 31,000. These figures are far from being final, especially as regards Asia, Africa and South America.

World Production

The outstanding fact in coal production is that, of the total average world production, over 70 per cent. is produced in three countries—the United States, Great Britain and Germany. The total world production of coal in 1913 was about 1,222 million tons and in 1932 about 1,000 million tons. The output of the principal producing countries for 1913, 1930 and 1932 is shown in the Table below.

Production of Coal

In Millions of Tons

	1913	1930	1932		1913	1930	1932
U.S.A. ...	519	482	355	Belgium ...	23	28	21
U.K. ...	292	248	209	India	17	23	22
Germany...	141	143	105	Czechoslovakia	19	15	11
France ...	44	55	46	Saar	12	13	10
U.S.S.R....	29	47	64	Netherlands ...	2	12	13
Poland ...	41	38	29	South Africa ...	8	12	11
Japan ...	23	29	28	Canada ...	14	10	12

If we include lignite (*i.e.*, brown coal with less heating power than ordinary coal) the figures for Germany become 160, 200 and 133 (expressing lignite in terms of coal) and for Czechoslovakia 28, 30 and 20.

Principal Coal Producing Regions

United States. The coalfields of the United States may be classified broadly as follows: (1) The *Pennsylvania Coalfield*, the largest anthracite field in the world; (2) the *Appalachian Coalfield*, stretching from Pittsburgh (Ohio) through West Virginia, Kentucky, Virginia and Tennessee to Alabama; (3) the *Interior Coalfields* of (*a*) Illinois, Indiana and western Kentucky; (*b*) Iowa, eastern Kansas, western Missouri, Oklahoma, Arkansas and Texas; and (*c*) the small Michigan coalfield; (4) the *Rocky Mountain Coalfields*—small, scattered fields of which the main centres are in Colorado and Wyoming; (5) the *Pacific Coalfields*—small fields, largely undeveloped, in California, Oregon and Washington; and (6) the *Gulf Coalfields*—also largely undeveloped.

Canada has four main coal regions: (1) the *Atlantic Coalfields*, of which those of Nova Scotia are the most important, the coal being

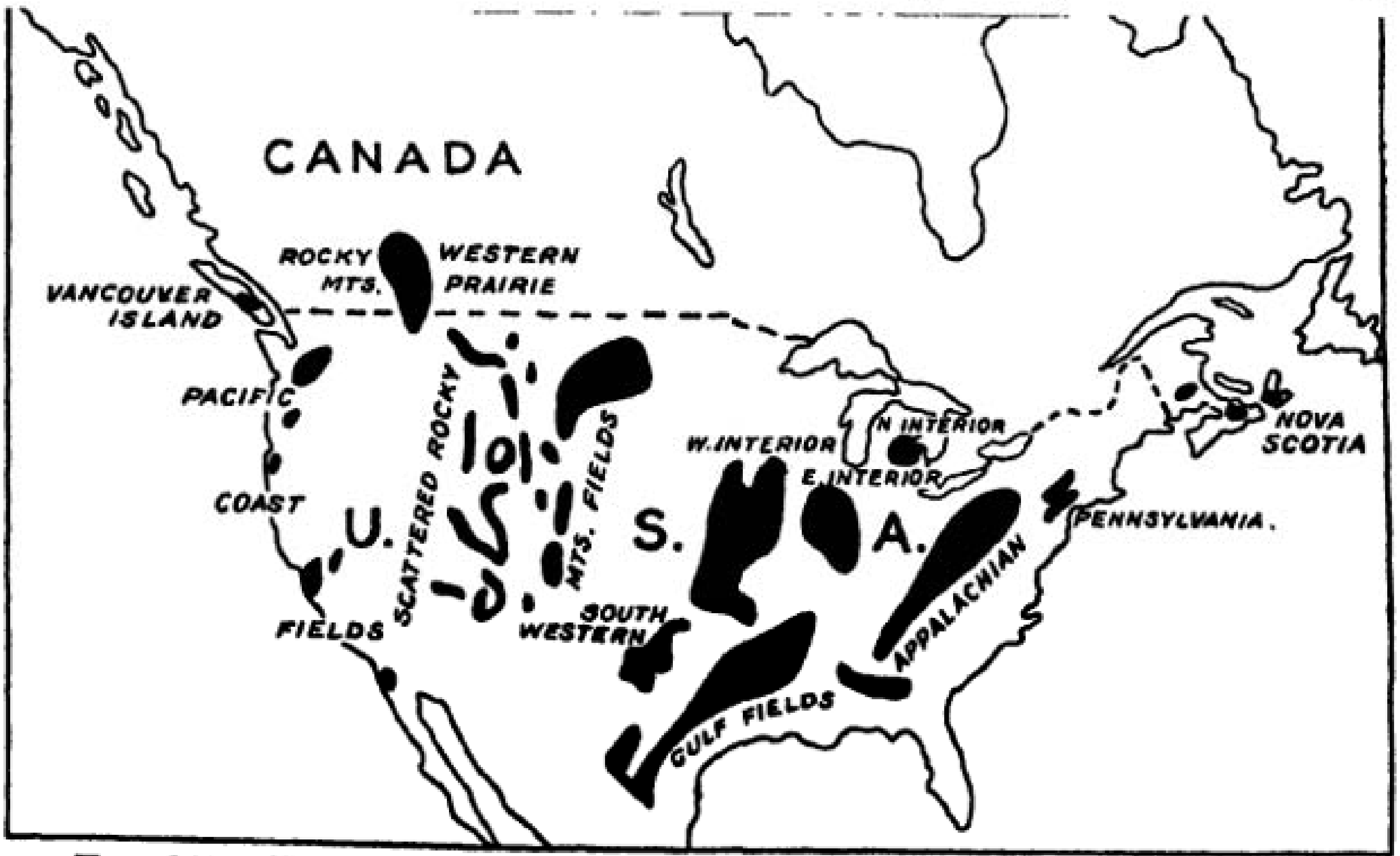


Fig. 107: The Approximate Situation and Extent of the Coal Resources of North America.

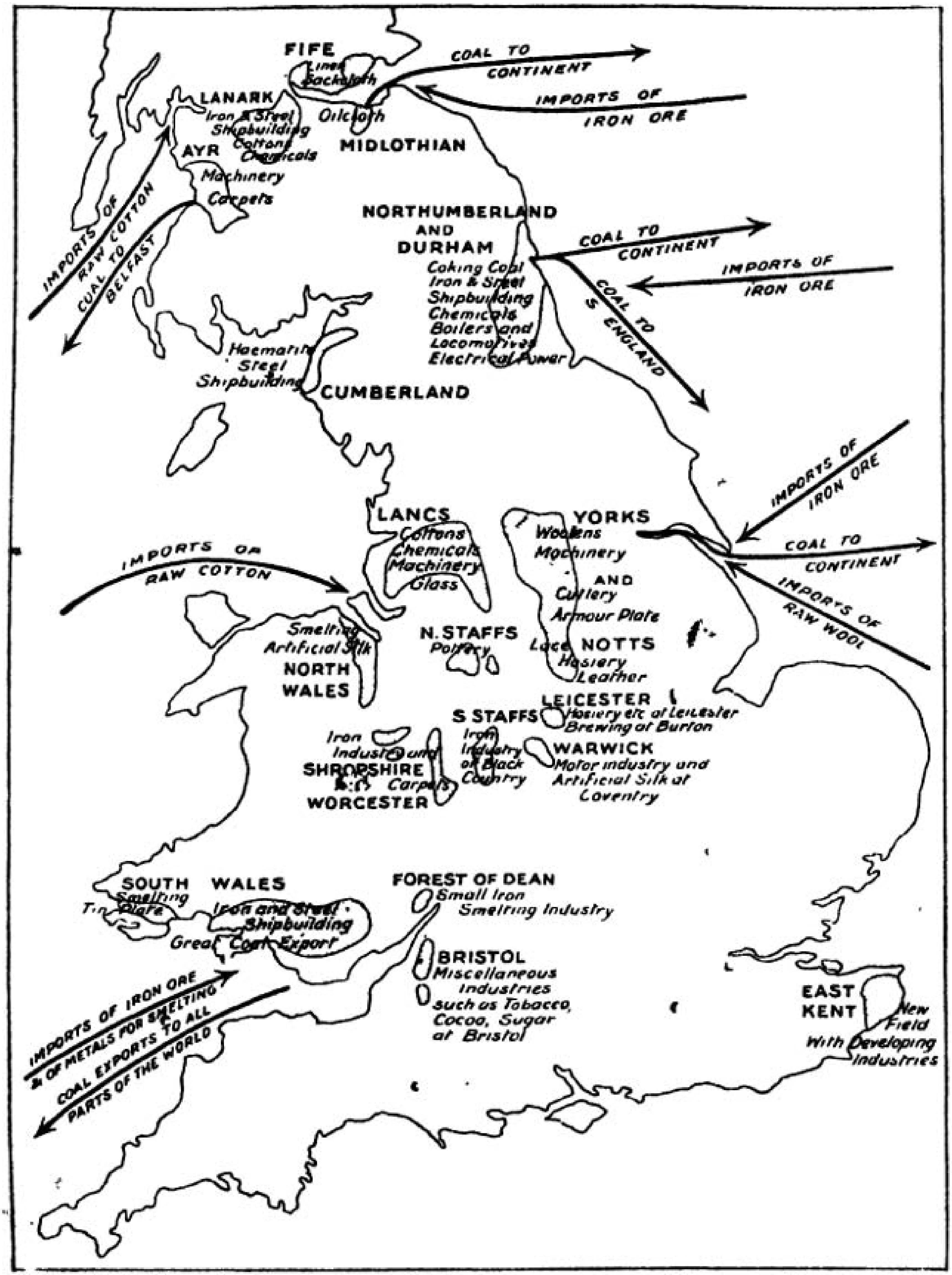


FIG. 108: THE COALFIELDS OF BRITAIN AND THEIR LEADING INDUSTRIES.

of good quality; (2) the *Western Prairie Coalfields* of Alberta and Saskatchewan—largely lignitic and bituminous, with a small anthracite field near Banff at the foot of the Rockies; (3) the *Rocky Mountain Coalfields* of British Columbia, the chief centres being Fernie and Kootenay; and (4) the *Pacific Coast Coalfields* of Vancouver Island (Nanaimo), with exports to the west of the United States, and the anthracite field of Queen Charlotte Islands.

The situation of the coal resources of North America is roughly shown in Fig. 107, which must be studied with the reservation that large areas of the known coal reserves as shown have not yet been exploited because commercial conditions do not yet warrant their development. The Gulf fields, for example, are as yet almost untouched; while the Rocky Mountain and Pacific fields are worked only in small, isolated centres.

South America. The only coalfields of note are those near Concepcion in *Chile*, but even here the output is small.

Europe produces more coal than North America. The principal producing countries are Great Britain, Germany, France, Belgium and Poland. The important *British* coalfields are found in Scotland (Ayrshire, Lanarkshire, Fife and Midlothian); Cumberland; Northumberland and Durham; Lancashire and Cheshire; Yorkshire, Derbyshire and Nottinghamshire; North Staffordshire; the Midlands (South Staffordshire, Warwickshire, Leicestershire and Shropshire); South Wales; North Wales; Bristol; the Forest of Dean; and Kent. The situation, extent and leading industries of the British coalfields are indicated in Fig. 108, but detailed treatment of these coalfields is reserved for Chapter 25.

The principal *Belgian* coalfield stretches from Liége to Mons. It extends westwards into *France*, where coal is found also in the Central Massif, and in the Sarre or Saar area. This was formerly German, but is now being exploited by France, and its ultimate ownership is to be decided by plebiscite. Belgium has another coalfield in the north (the Campine) and this extends into south-eastern *Holland* (the Limburg field). The *German* coalfields are situated in the Ruhr district (the great industrial area of Germany), in Saxony and in Upper Silesia, the last-named being now divided between Germany, Poland and

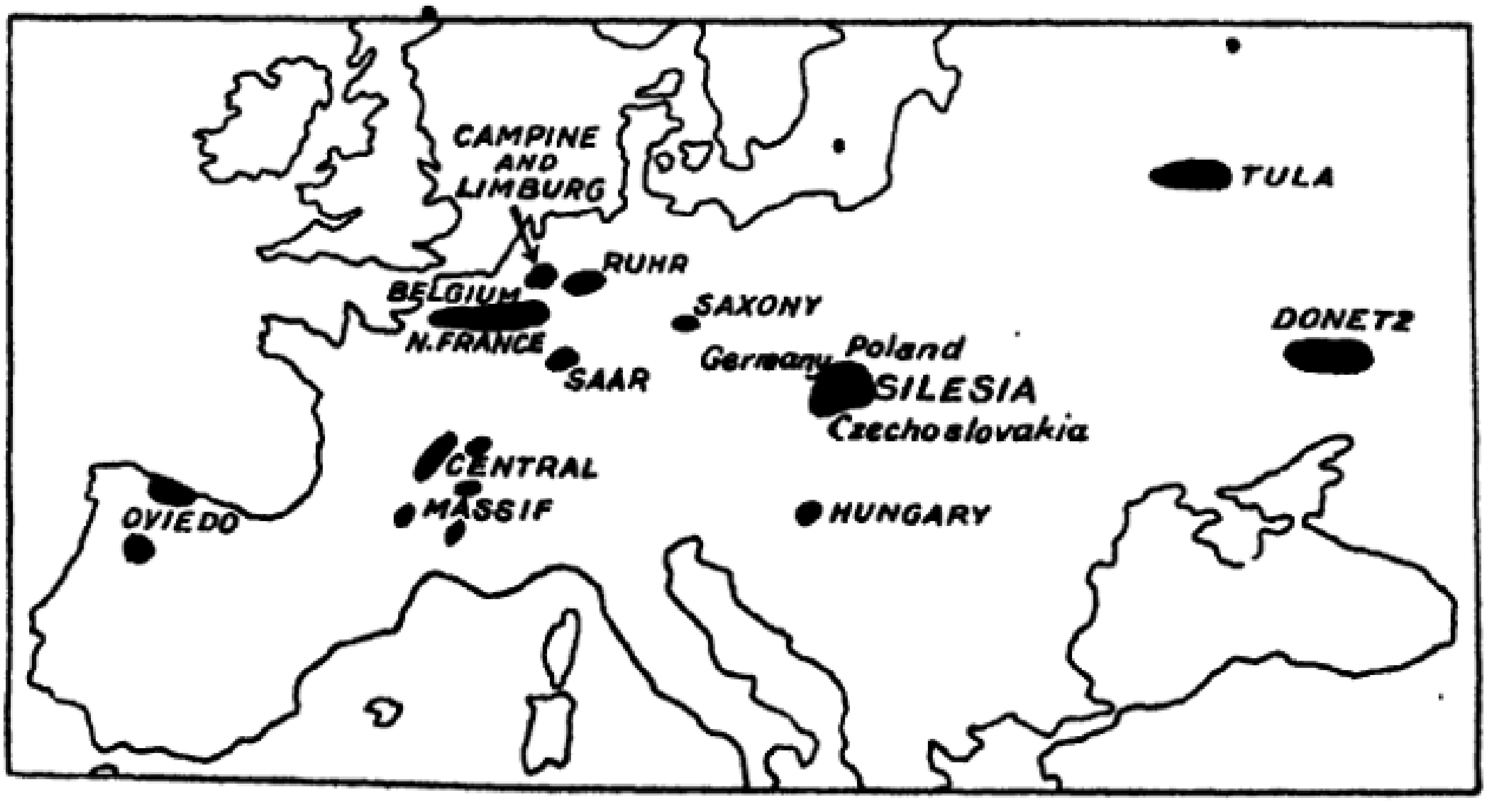


Fig. 109: The Principal Coalfields of Continental Europe.

Czechoslovakia. In *Spain*, coal is worked in the Oviedo district in the north.

U.S.S.R. European Russia has large coalfields around Tula and in the basin of the Don.

AFRICA has few developed coalfields. The most important are the *Transvaal* fields (at Witbank and Middelburg, and near the Rand, at Vereeniging and Boksburg); and the *Natal* fields (Newcastle and Dundee districts). The Union has smaller fields in the north of the *Orange Free State* and in *Cape Province*. The Transvaal fields send their coal to the Rand, while Natal exports coal through Durban, which is also an important coal-bunkering port for ships bound to and from the East. Coal is found in both North and South *Rhodesia*, but at present is important only at Wankie in Southern Rhodesia, where it is used on the railway and at the mines. In *West Africa* coal is found along both banks of the Niger on the coastal plain, and is mined for use on the railways at Udi in *Southern Nigeria*.

ASIA. *India* is next in importance to Britain as an Empire coal-producer and, in addition to the worked resources, there are considerable unworked reserves in the country. The principal coalfield is in the Gondwana district of Bihar and Orissa and of Bengal. In the west, this coalfield extends into Central India, the Central Provinces and Hyderabad. Apart from this major area, Assam, Baluchistan, Punjab and Rajputana have tertiary coalfields. Indian coal, otherwise quite useful, suffers from the great disadvantage that it is not suitable for the production of coke.

The principal coal deposits of *Japan* are in the islands of Kiushiu (near Nagasaki) and in the island of Hokkaido (near Hakodate). In *China* there are enormous deposits of coal in North China, principally North Shansi, South Shansi, North Shantung and the south-east portion of the North China Plain; in the Yangtse basin, principally at Leiyang and the Siang river basin; in the basin of Szechwan; and in Kweichow and Yunnan. Only a small proportion of the Chinese coal resources have so far been tapped and that mainly with Japanese capital. There are enormous reserves awaiting development, as, for example, in the Shansi field, which covers over 13,000 sq. miles. Here the coal lies near the surface and is also near supplies of iron ore. Everything, therefore, points to an era of great industrial activity in this area in the future. But both in Shansi and elsewhere the deposits are situated inland and the difficulty of transport greatly increases the costs. *Manchuria* has become an important coal producer in recent years, the output exceeding 10 million metric tons per annum. The resources have been developed by Japan, who takes the bulk of the production.

AUSTRALASIA. The most important coalfields of *Australia* are those of New South Wales, which extend in a semi-circle round Sydney to Newcastle in the north, Lithgow in the west and Bulli in the south.

Next in importance are the coalfields of Queensland, worked chiefly at Ipswich and to a less extent at Clermont. There are enormous deposits of brown coal in the Gippsland region of Victoria, of which the Morwell deposits alone contain 5,000 million tons. In Western Australia coal is mined at Collie, near the port of Bunbury, while in Tasmania the principal region is round Fingal in the east.

In *New Zealand* coal is the most valuable mineral mined. Bituminous coal is worked in South Island (Westport and Greymouth); semi-bituminous coal in North Auckland (Kawakawa); brown coal and anthracite in Canterbury; and brown coal, lignite and semi-bituminous coal in Southland and Otago.

Commerce in Coal

There have been considerable changes in the trade in coal since 1913, and in order fully to appreciate these changes it is necessary to consider the position of the coal industry during the pre-war period.

The possession of coal deposits enabled those countries who had them to take full advantage of the industrial changes brought about by railway development, steamship development and the growth of the iron and steel industry. In addition, the demand from those countries which did not possess an adequate supply of coal gave rise to a considerable export trade in this commodity. The conditions affecting the development of the coal industry in different countries have been (*a*) the suitability of the coal for various technical purposes; (*b*) the distance from the coalfields to the seaboard, and (*c*) the distance of the coal supplies from deposits of the raw material used by the big coal-consuming industries.

UNITED STATES. Here the coal deposits are all far inland—all more than 300 miles from the seaboard—with the result that the coal has always been used for inland consumption, in industry or otherwise, and little has been exported. The coal export in 1913 was only 5 per cent. of the total production. Of this export, Canada took 60 per cent. while the greater part of the remainder was sent to Central America and Brazil.

GREAT BRITAIN. All the coalfields in this country are situated near the seaboard (none is 100 miles from it), and thus the export trade in the mineral expanded at a rapid rate. The great advantage of Britain's insular position from the coal export standpoint was increased by the fact that, as full *inward* cargoes of raw materials (such as cotton and wool) were essential to her industries, full *outward* cargoes of coal could be provided as return freights with the effect of cheapening the cost of both inward and outward voyages. For some years prior to 1914, about one-half of our coal export was used for bunkering ships in other countries and at coaling stations *en route*. The exports were directed mainly to the North Sea Region (26 million tons), the Mediterranean (23 million tons), the Baltic Region (16 million tons) and South America (7 million tons). Of the coal exported, 75 per cent. was steam coal.

GERMANY. The development of Germany's coal resources occurred chiefly in the Westphalian Region, where the iron and steel industry expanded at a rapid rate, and also in Upper Silesia, where there is a considerable metallurgical industry. The pre-war export trade from Germany was directed to supplying the needs of regions comparatively near her coalfields, hence the countries taking the largest quantities of German coal were Austria-Hungary (12 million tons), the Netherlands (7 million tons), Belgium (6 million tons), France (3 million tons) and Russia (2 million tons). Areas on the North Sea and Baltic Coasts, even of Germany herself, obtained most of their coal from Britain because freight costs for sea transport were lower than railway charges to the same places.

The export of coal from the leading countries in pre-war and post-war periods is shown in the following Table. The figures include coke, and, in the case of Britain, the figures exclude coal used in the bunkers of ships in foreign trade.

Exports of Coal

IN MILLIONS OF TONS

	1913	1925	1930[1]
Great Britain ...	78·3	55·6	60·1
Germany... ...	45·3	33·5	22·3
U.S.A. ...	22·2	19·8	20·2
Poland ...	11·4	8·1	12·4

[1] Estimates only, including coke, lignite and briquettes in terms of coal.

The post-war trade in coal shows considerable changes, of which the most noteworthy is the great decline in the British and German exports. The decreased exports from Britain are a result of the capture of our markets by other countries and of the increased use of oil in place of coal—the complete cessation of our exports to Russia alone account for a 60 per cent. loss of our Baltic region exports. In the case of Germany, the decline is due to the transference of coal-producing areas to other countries under the Versailles Treaty. The world depression has in latter years been a factor in the decrease in coal exports.

In 1933, Great Britain exported 39 million tons of coal and an additional 14 million tons was used in ships' bunkers. The leading importers of British coal in 1933 were France (about 20 per cent. of the total), Italy (12 per cent.), Denmark, Germany, Sweden, the Argentine, Canada, the Netherlands, Belgium, Egypt, the Irish Free State, Spain and Algeria. Poland exports mainly to northern Europe and the Baltic countries; Germany's chief coal markets are still in the Netherlands, Belgium, France and southern Europe; and the United States exports to Canada and South America.

Experiments in the production of oil from coal should give a stimulus to the coal industry of Britain. Oil is already being produced from coal, *e.g.*, by the hydrogenation process at the Billingham-on-Tees works of Imperial Chemicals, Ltd., and the development of the industry has been encouraged by the granting of a preference on home-produced oil and the use of that oil in the Royal Navy and the Royal Air Force.

OIL

Mineral oil, or petroleum (excluding petroleum obtained from coal by means of chemical processes), is found in sedimentary rocks and is probably the result of the decomposition of vegetable matter in deltas, brackish lakes or other shallow expanses of water. Oil is usually found in bands of porous sands which occur between non-porous beds of clay or shale, through which the oil cannot pass. Further, the formation has usually been bent into an arch-like fold or anticline so that the oil rises to the top of the arch, and is often surmounted by a layer of gas.

Oil is much more easily obtained than coal, and one important reason for the remarkable increase in its production and use is its cheapness as a source of power and its consequent effect in reducing the costs of industry. As oil is a liquid, it will flow, and thus, when a hole is bored down to the stratum, the oil enters into the bore-hole of its own accord or in response to pumping. Sometimes the oil rushes up the bore with great force, and thousands of gallons may run away as waste before the hole is successfully tapped. Despite such happenings, however, the cost of procuring oil is low because it requires relatively inexpensive plant to bring it to the surface and because no underground workings are necessary as in the case of coal. Transport, also, is much easier and less costly than in the case of coal, for the oil can be transported for hundreds of miles through pipes and delivered at seaports, or wherever it may be needed, at a fraction of the cost of carrying coal. Finally, the calorific value of oil is greater than that of coal, while it is much cleaner to handle than coal and takes much less space relatively to its energy-producing power.

Unfortunately, the world's supply of petroleum is being rapidly and wastefully exhausted, so the likelihood is that world supplies of natural oil will be used up long before many of the great coal reserves have even been touched.

World Production of Oil

The world production of crude petroleum in 1933 was about 196 million metric tons. The principal producing countries are shown in the Table below, from which it will be seen that the United States produced over 60 per cent. of the total world output.

Production of Petroleum

In Millions of Metric Tons

U.S.A.	122·8
U.S.S.R.	21·4
Venezuela	16·6
Rumania	7·4
Persia	7·0
Netherlands East Indies	5·5
Mexico	4·6
Peru	1·9
Argentina	1·9
Colombia	1·8
Trinidad	1·3
India	1·2

The life of an oil well is frequently very short and therefore any detailed account of the oil-bearing areas of the world is of little real value in a published book. Oil fields producing vast quantities of oil at present may cease altogether in two or three years, while entirely new areas are being periodically tapped and brought into the sphere of production.

North America. In the United States the regions of greatest production are constantly changing; for example, Michigan had an output of 600,000 barrels in 1928 whereas in 1929 the output was nearly 4½ million barrels; in 1929, about 15,500 new wells came into production whilst in the same year over 15,000 old wells were abandoned. The great bulk of the petroleum is obtained at present from Texas, California and Oklahoma. Californian oil is the most important because of its high quality, and Los Angeles owes much of its importance to the development of the oil industry. Less important fields occur in the Appalachian region, coinciding roughly with the Appalachian coal deposits, and in Kansas, Louisiana, Wyoming and other States. In *Mexico*, oil is obtained mainly from the Ebano district near the port of Tampico and near the port of Tuxpan. Other districts are Panuco, Huastica and Tehuantepec-Tobasco. In *Canada*, the leading oil-producing provinces at the present time in order of importance are Alberta, Ontario and New Brunswick. The output is increasing, particularly in Alberta, where the chief fields lie in the Turner Valley (the most important), Wainwright and Red Coulee.

South America. The principal oil-producing countries are Venezuela (third in importance to the United States at present), Colombia, Peru, Argentina and Trinidad. In *Venezuela* the oil is obtained from the Maracaibo district; in *Colombia*, from the basin of the Magdalena; in *Peru* from mines in the north and centre; in *Argentina* from the Commodoro Rivadavia region; and in *Trinidad* from the Central Range anticline in the south of the island.

Europe has little oil, the principal fields being in *Rumania* (Prahova and Dimbovitza), with less important fields in *Poland* and *Germany*.

U.S.S.R. Russia is at the moment second in importance of the oil-producing countries, and the output is increasing. The Caucasus region is the most important, the principal centres being at Baku and Grozny in *European Russia*, in *Azerbaijan* (Transcaucasia) and in *Russian Turkestan*.

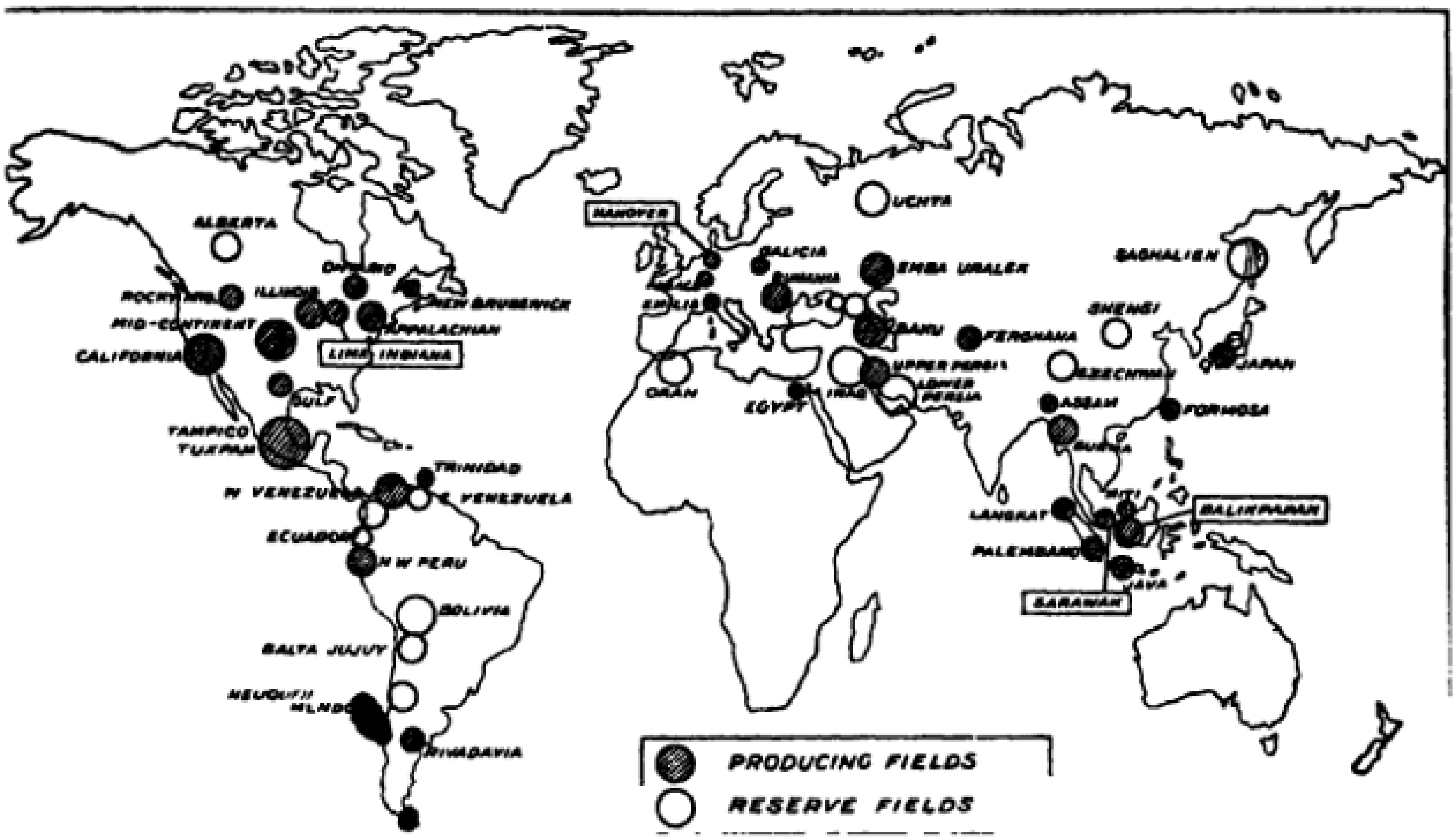


FIG. 110: DISTRIBUTION OF PETROLEUM SUPPLIES.

ASIA. In *India* the principal fields are at Yenangyaung and Singu in Burma, where there are also several other fields. Less important fields lie in the Punjab (Attock) and Assam (Digboi and other fields). *Persia* produces oil at Maidan-i-Naftan. Other Asiatic producers are *Iraq* (Mosul and elsewhere); the *Netherlands East Indies* (Java, Sumatra and Borneo); *Sarawak* (Miri districts), and *Japan* (very little).

Commerce in Oil

The United States imports crude oil for refining and exports considerable quantities of refined oil products. In spite of the large home consumption, there is a net export of petroleum and petroleum products. The leading exporting countries are Mexico, the East Indies, the South American States, Persia and the U.S.S.R. Burma's output is absorbed by India. The other importing countries are Great Britain, Canada and the European countries.

Consumption of Oil

Crude oil is used as ordinary boiler fuel, mainly in ships where oil tanks take up less space than coal bunkers and where the cost of labour is less than is the case when coal is used. Oil is also being increasingly used for locomotives.

In most cases when crude oil is used either in ships or elsewhere, the motive power is supplied by the Diesel engine, an internal combustion engine which has the great advantage in cost of being able to use crude petroleum as it comes from the wells. It is so efficient that a gallon of oil costing a few pence will develop 15 horsepower hours.

Petrol, a highly important product of the distillation of crude oil, is widely used as a source of power in internal combustion engines, especially for motor cars, the vast development of which in recent years is largely attributable to the relatively cheap cost of petrol. At the present time, the world uses ten times as much petrol as it did in 1914, and the amount of petrol recoverable from crude oil has increased from 25 per cent. in 1914 to about 40 per cent. at the present time.

The heavier constituents of petroleum furnish the fine lubricating oils extensively used in all forms of machinery, and this, in fact, is one of the main reasons for the rapid exploitation of petroleum. Oil for internal combustion engines may be obtained from sources other than petroleum (alcohol can be obtained from wood, and oil can be obtained from shale and soft coal), but no efficient substitute has been found for the petroleum lubricants. No animal or vegetable oil is so efficient, and unless an effective substitute is found, the exhaustion of the world's petroleum supplies will have a far-reaching effect on industries using high-speed machinery.

The increase in the use of oil fuel at sea has affected Great Britain more seriously than other countries because of the amount of bunker coal which she has hitherto exported for use in different parts of the world.

Natural Gas

The subject of oil cannot be dismissed without some mention of the wonderfully valuable fuel known as " natural gas ". This occurs in most oil-fields, where it rises to the top of the oil-pool and can be tapped for domestic and industrial use with relative ease. It is much better in use than the gas manufactured from coal at such great expense, but unfortunately, the natural supplies which exist have been carelessly exploited, while the life of the average gas well is even shorter than that of an oil well.

Natural gas cannot, of course, be economically transported for any great distance, and its use is therefore limited to the locality in which it is found. It has, however, proved specially valuable in the American oil-fields as boiler fuel, as city gas and, above all, in the iron and glass industries. In 1913 the price of natural gas was 2½d. per thousand cubic feet, whilst to-day it is from 2s. 6d. to 3s. per thousand feet—very little cheaper than coal gas. This increase in price is, in itself, an indication of the decrease in the available supplies, and there is little doubt that in a short time the existing supplies will be quite exhausted.

WATER-POWER

Water furnishes the cheapest kind of power, but its use for the purpose is satisfactory only if the water flows regularly at all seasons at the point where it is utilised and if it falls rapidly enough and in sufficient quantity to provide a good "head". The conditions favourable to its development in a country are thus (1) rugged relief, (2) lakes or other reservoirs, and (3) an abundant precipitation evenly distributed.

In regions of rugged relief, streams descend by falls and rapids and as a rule, therefore, their energy can be easily harnessed. Norway, Sweden, Switzerland and other mountainous countries are thus favoured by nature for the utilisation of water-power. Lakes serve not only as reservoirs in which the water is or can be stored, but also tend to regulate and keep constant the flow of water in the power-providing streams in spite of variations in rainfall from season to season. The Niagara river, with the Great Lakes behind it, is so constant in flow that it carries only one-third more water at its highest level than at its lowest. The Potomac, with no lakes, is sometimes 250 times as large in flood as at low water. Abundant rainfall is a great factor in water supply. Regions with a marked dry season, such as Mediterranean lands, have streams which dwindle to nothing in the dry period and are swollen torrents in the rainy season. This irregularity is an obvious drawback to the use of such streams as sources of power.

As a rule, glaciated regions provide the best supplies of water-power, for the reasons that they are nearly all regions of rugged relief, have abundant rapids, falls and lakes, and usually occur in areas of abundant precipitation. Over 90 per cent. of the world's lakes exist in hollows formed as the result of glaciation, while the Niagara Falls were created when ice closed the ancient outlet of Lake Erie.

The primitive way of using moving water is to make it turn a simple water wheel, and in small industries this method is still in use, especially for grinding corn. For the large-scale generation of power, the water is made to turn a *turbine*, a flanged wheel of slightly different type from the water-wheel, and very much more efficient. The turbine in its turn actuates a dynamo and so produces electricity. Power of this nature is known as *hydro-electric power*, and for certain industries it is economically essential. In these industries the generation of a sufficiently powerful current with fuel as the source of power would be possible only at a cost which would make it commercially unprofitable. Such industries are those in which excessively high temperatures have to be produced, as in the smelting of aluminium ores, the manufacture of carbide of calcium and the fixation of atmospheric nitrogen, and those in which great resistances have to be overcome, as in the grinding of wood to wood-pulp.

Water-Power Resources of the World

It is an important fact that water-power is available as a rule mainly in those countries where there is no coal or oil, although in some countries all three sources of power are abundant. Norway, Italy and Switzerland are outstanding examples of countries with neither coal nor oil, but with abundant water-power which has been developed to such an extent as to enable these countries to manufacture certain types of goods on a large scale.

In reading the following Table, it should be borne in mind that each installed horse-power in the case of water-power is considered to save six to ten tons of coal per annum.

Water-Power of the Leading Countries

IN MILLION HORSE-POWER

	Available	*Installed*		*Available*	*Installed*
U.S.A.	35·8	11·0	Switzerland ...	4·5	1·8
Canada	32·1	7·3	Japan	6·5	1·8
South America ...	30·0	4·0	Sweden	8·8	1·6
France	10·8	3·2	Spain	6·0	1·3
Italy	8·0	3·2	Germany... ...	4·8	1·1
Norway	16·5	2·0	Britain	1·0	·25

NORTH AMERICA has developed her water-power resources to a much greater extent than any other continent. Much of the industrial development of the east of the *United States* is a result of the utilisation of water as a source of power, particularly in the regions around the Niagara Falls, on the Fall Line, and in New England, south of the Great Lakes. *California*, too, is now becoming industrialised with water as one of its chief power resources, whilst the Rocky Mountain States have considerable water-power resources available though as yet scarcely touched.

Canada is fortunate in possessing water available for power in regions which are lacking in coal,—in particular, in the industrial area of southern Ontario and Quebec which uses a great deal of hydro-electric power. In this region, local paper and pulp industries have developed solely as a result of the utilisation of water-power whilst the central electric stations derive nearly all their power from the same source. Development of water-power is also taking place in British Columbia.

South America has about 30 million horse-power available but it has scarcely been tapped.

[*By courtesy of the Canadian Pacific Railway.*

THE HUGE HYDRO-ELECTRIC POWER STATION AT THE FOOT OF THE MONTGOMERY FALLS (MONTREAL).

Africa has more available water-power than any other continent—nearly 200 million horsepower—but these vast resources are still practically untouched and await development by man. A commencement has, however, been made in the Victoria Falls region.

Asia is another continent which has great potential supplies of water-power. The total available is about 70 million (the same as in North America) but, as in the case of Africa and South America, it still lies dormant.

Australasia. There are small but important hydro-electric schemes in Tasmania and New Zealand. In *Tasmania* about 100,000 h.p. has been developed from the Great Lake on the Central Plateau for use in factories and for supplying electric energy to all parts of the island. Development has been fostered mainly as a result of the scarcity of coal.

New Zealand also has developed about 100,000 h.p., mainly from Lake Coleridge and the Waikato River. There are about 5 million h.p.

available in the Dominion but its utilisation is delayed by the slowness of industrial development.

EUROPE. *Norway* and *Sweden* have developed hydro-electric power because they lack coal and oil. Further development is somewhat handicapped owing to the freezing of the northern rivers in winter, but the chemical industry and wood industries have flourished with the development of water-power. *France* has a relatively small supply of coal and has developed water-power in the Pyrenees, the Central Massif, the Rhône valley and the Alps. A similar but more acute lack of coal has caused development of water-power in the Alpine and Apennine regions of *Italy*, in which country the supply of cheap power has caused the establishment of numerous manufacturing centres, more especially in the north. *Switzerland*, another country lacking local supplies of coal and oil, has made good use of the water-power available in Alpine streams. Even the poorest Swiss chalets have the benefit of cheap electricity for domestic lighting and other purposes, while the Swiss railways are almost entirely run by electric power derived from water, and quite a number of important manufacturing industries owe their rise and growth to the power derived from hydro-electric stations.

ELECTRICITY

Electricity for domestic or commercial purposes is not derived directly from any natural source. It is a form into which energy is conveniently transformed for easy transmission after it has been produced by the use of a fuel, a water-fall or some other agency. This possibility of transforming energy derived from natural resources into electricity is a factor of the utmost importance in industrial and commercial development. In the United States electric power produced by falling water is transmitted for distances of about 400 miles to centres of industry and population, while in Africa it is proposed to transmit electricity from the Victoria Falls of the Zambesi to the Johannesburg district, a distance of 700 miles.

It has been stated that the use of water instead of coal saves over six tons of coal per annum per horsepower developed, and this fact alone indicates the great economy which can be achieved by the use of water-power instead of fuel. Further, we have seen that, without cheap supplies of electricity from water-power, certain industries would not be commercially possible. Even when electricity has to be generated by means of coal or other fuel, it is markedly economical and advantageous to establish a large installation where coal is cheap or easily available, and to supply industries at some distance from the generating station. This factor is becoming increasingly important in this country, and there are vast schemes in operation for producing electricity on the coalfields and transmitting it to the centres of industry and population. This development of the "Grid" system has made it possible to establish great industries in the south of England, far away from the old sources of power, and is one of the factors responsible for the increased industrialisation of southern England.

Electricity is not only the most convenient form in which energy can be transmitted, but it is almost an ideal form for driving machinery. The necessary motors are compact and are very simple to control. They will run in any position and suffer very little from wear and tear. For lighting, it is necessary only to switch on the current and allow it to pass through a suitable substance—no ignition is required.

Electricity maintains a smooth, steady effort at all speeds, and is particularly efficient in comparison with steam at very high and very low speeds. It gives much quicker acceleration, and is thus the best motive power for local railways where stops are frequent and speed is essential; for example, underground railways and the electric railways serving the outlying districts of the London area. Moreover, where the lines are not level, the motors can generate electricity on down gradients and thus economise the power used. Finally, one of the greatest advantages of electricity is that where it is used the air is not polluted by smoke from coal fuel.

THE SUN

All power comes from the sun. We utilise its energy indirectly when we burn fuel or harness waterfalls or obtain power in any other way. These sources are simply stores of solar energy. But apart from this, the heat of the sun is being continually lavished in vast quantities over great areas of the earth's surface, yet man has so far devised no really effective method of retaining or of using this immense source of energy. Every day an enormous quantity of solar heat is expended in warming the surface of the earth and is later wasted when that surface cools again.

Many experiments have been made to catch and store the direct energy of the sun, and some of these have shown some promise of success. In one workable arrangement gigantic reflectors have been devised to collect the rays falling on a relatively wide area and to concentrate them on a central boiler. So far, however, none of the methods hitherto devised has proved commercially profitable and none yet rivals the other methods of raising steam. The work is going on, however, and it is likely that efficient engines will be developed in time. If so, the energy problem will be much reduced in urgency, if it is not completely solved. That this is not an exaggeration will be clear when it is realised, for example, that any *two* of the 245 counties of the State of Texas receive enough energy from the sun to supply all the power required by the factories and transport systems of the entire United States.

ALCOHOL

Alcohol is a valuable source of power. It can and probably will take the place of petrol as the petroleum supplies approach exhaustion. Alcohol is extracted from vegetable matter, and its source of supply is, therefore, being continuously replenished. Germany is already producing large quantities from potatoes.

TIDES

Enormous power goes to waste with the ebb and flow of the tides, and this potential source of energy also is receiving attention with a view to its effective utilisation, but the results obtained so far are not commercially important.

WIND

Wind is used for motive power to a certain extent in flat countries such as Holland and in various parts of England. Wind power has the disadvantages that it is irregular in strength and unreliable, but, where the time taken over the operation is not important, as in grinding corn or pumping water, it is a valuable source of cheap power.

☞ QUESTIONS.

See end of Chapter 13.

CHAPTER 13

OTHER COMMERCIAL AND INDUSTRIAL MATERIALS

WITH the exception of coal, salt and oil, minerals are seldom found in plains and never in the vast alluvial and deltaic flats where the old civilisations flourished. Salt is usually found in these regions as a product of deposition and the evaporation of salt water, while coal occurs where the earth has been levelled as a result of centuries of erosion. With these exceptions minerals almost always occur in mountainous regions where the bending and fracturing of the rocks have facilitated infiltration of mineral matter with concentration in lodes or veins. Even where minerals occur in lands of gentle relief (*e.g.*, the Lake Superior region), it is found that the district is a worn-down mountain area, with the mineral veins in the ancient folds.

The factors governing the production of minerals differ materially from those which govern the production of crops and animals. Crops can be grown and animals can be reared over long periods in the same district, and there is generally a steady increase in their production coincident with the growth and development of the area. Minerals show no such continuity and increase. Sooner or later the supplies become exhausted, and the area is then abandoned for other newly discovered sources of supply. Moreover, the demand for some minerals may change markedly with taste or fashion, or by reason of the utilisation of substitutes.

So far as minerals are concerned, therefore, supply and demand fluctuate in a very irregular manner, whereas the demand for crops and animals increases regularly with population, and the supply must do the same. Adequate supplies of food are, of course, essential to man's existence, whereas minerals are not such a vital need although they are the basis of industrial prosperity.

Again, the development of minerals may be retarded by one or some of several factors: by lack of transport facilities or power, or by lack of capital (*e.g.*, parts of South America); by political unrest (*e.g.*, China); and by backwardness in the habits of the people (*e.g.*, India and China). Severe climate, also, may retard development, but this disadvantage may be overcome if the minerals are sufficiently valuable, as was the case with the Klondyke goldfields of frozen Alaska and the Kalgoorlie goldfields of the inhospitable Australian desert.

BASE METALS

Iron.

Iron does not occur in the pure state in nature. It is always combined with other elements and impurities to form *iron ores* of different kinds which are found in abundance in rocks in many parts of the world. Indeed, after silicon, oxygen and aluminium, iron is the most common element in the earth's crust, constituting about 4·5 per cent. of the total; but only those ores which have a considerable percentage of metallic iron are worked for industrial purposes. The principal iron ores are iron oxides, hydrated iron oxides, iron sulphides and iron carbonates.

IRON OXIDES. Of these, the two most important are *haematite*, yielding up to 70 per cent. of iron, and *magnetite*, yielding up to 72 per cent. of iron. They are found either in masses in igneous rocks, metamorphic rocks and limestones, or in veins, generally in igneous rocks. Furness (Lancashire), Spain, Sweden, Elba and Algeria produce haematite.

HYDRATED OXIDES. The most important of these is *limonite*, sometimes called brown haematite. These ores yield only from 10–40 per cent. of iron, but they occur in thick beds over wide areas and are easily worked. The Cleveland (Yorkshire), the Lincoln, the Rutland and Northamptonshire, and the Lorraine ores are of this type.

SULPHIDES. *Iron pyrites* and *copper pyrites* are ores of this kind, but they are used as sources of sulphur and copper respectively, rather than of iron.

IRON CARBONATES. These include *siderite*, *clay ironstones* and *blackband ironstone*. They are worked commercially if the percentage of iron is sufficiently high, or if the beds are extensive and easily accessible. They occur on many British coalfields.

When iron is mixed with carbon up to not less than 0·3 per cent. and not more than 2·2 per cent., the resulting metal is known as *steel*, which is a tenacious, flexible, elastic and very hard form of iron. Very slight amounts of phosphates in the ore make steel brittle, so that, until a cheap method of eliminating the phosphorus was discovered, only those ores free from phosphorus were used for steel manufacturing on a large scale. This factor was of the greatest importance in the rise of Britain as a steel producer, for not only had she considerable deposits of haematite (non-phosphoric ore), but she could import such ores cheaply by sea from Sweden, Spain and Italy to Newcastle and Middlesbrough, whereas continental towns using the same ores had to import them part of the way by sea and part by railway, canal or river. In any case, a railway journey or transhipment to barges was essential and necessarily added to the cost of the raw material. The discovery of a method of removing phosphorus during the process of converting the iron into steel was of world wide importance, since it enabled the Lorraine ores amongst others to compete more effectively with Britain in the iron and steel industry.

The iron which comes from the blast furnaces in which ore, coal and flux (generally limestone) are burned together under a strong air draught is called *pig-iron*. It contains various impurities, such as carbon, sulphur and phosphorus, but it may be used as *cast-iron* without further purification. When the carbon in pig-iron is burnt out in what is known as a "puddling furnace", *wrought-iron* is produced.

The United States produce about one-third of the total world output of iron ore. About 85 per cent. of the total is haematite from the Lake Superior region, where the ores occur in the Mesabi, Vermilion, Cuyuna, Gogebic, Marquette and Menominee Ranges in Minnesota, Wisconsin and Michigan. The other leading centre is Birmingham in Alabama, where the ore is obtained from the eastern margin of the Appalachians. The home production of iron in the United States is insufficient to satisfy the requirements of the vast iron and steel industries of that country, so that imports are obtained from Spain, Sweden, North Africa and Cuba.

Great Britain. Haematites occur in Lancashire (Furness) and Cumberland; limonites in Cleveland (Yorkshire), Lincolnshire, Rutland and Northamptonshire; and blackband and clay ironstone in South Staffordshire. Britain produces from 50–70 per cent. of her requirements of iron ore, importing mainly high-grade ores from Spain, North Africa and Scandinavia.

France. Almost the entire French production of iron ore consists of limonites from Lorraine. There are deposits of iron on the Le Creuzot coalfield also, and these have given rise to a varied iron and steel industry in this region.

Germany has deposits in the Siegerland (Ruhr region), near Hanover, as well as in Silesia, but they are insufficient to feed the vast steel industries of the country, and imports are obtained from Spain, Sweden and Lorraine. Prior to 1914, 75 per cent. of Germany's iron ore came from Lorraine, but as that area now belongs to France, Germany has to import about two-thirds of her requirements.

Spain is very rich in iron ores, chiefly high-grade haematites which are exported mainly to Britain and Germany. The principal mining centres are in the north near the ports of Bilbao, Gijon and Santander. Other deposits occur in the south, chiefly in Almeria and Murcia.

Sweden. Vast masses of magnetite occur in North Sweden in the Gellivara and Kirunavara areas, and in winter are taken by electric railway to Narvik on the Norwegian coast for export. Deposits also occur in Central and South Sweden.

Belgium and Luxemburg have ores which are a continuation of the geological strata of Lorraine.

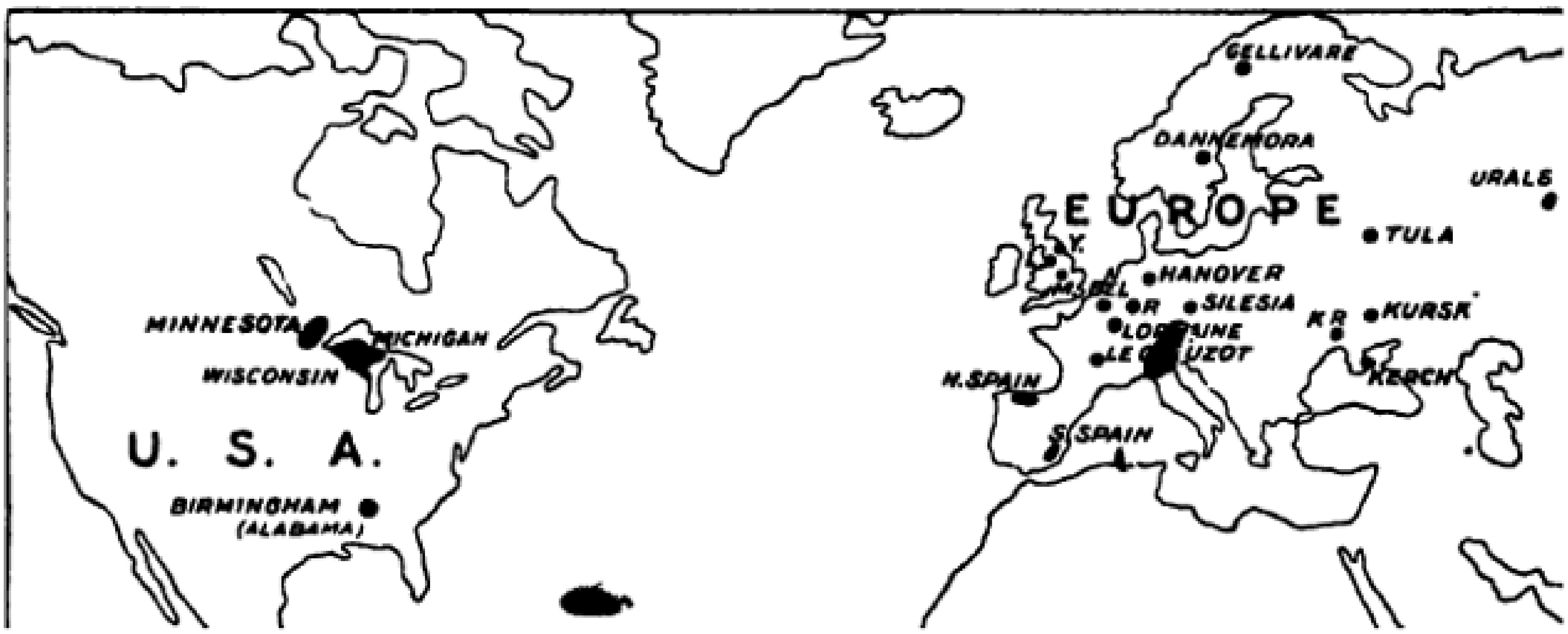


Fig. 111: Iron Ore Centres of North America and Europe.

The U.S.S.R. has great deposits of haematite (50–70 per cent. iron) in the district of Krivoi Rog, whilst the Kursk province has masses of similar ores at great depths. The Urals have deposits, whilst Kerch in the Crimea has ores similar to those of Luxemburg. Tula, south of Moscow, also has iron ores, and there are large deposits in southern Siberia.

India is steadily increasing her production of iron ore. In 1913 her output amounted to only 377,000 metric tons whereas she now produces about 2,000,000 tons and is the second of the Empire iron-producing countries, whilst she has very large reserves. The principal producing centres are conveniently situated near coal supplies on the Bihar and Orissa coalfield, but the haematite is not suitable for direct use in blast furnaces because it occurs in powdered form and the coal is not of the type suitable for making metallurgical coke. Hence the slow development of the iron and steel industry in India.

Other producers are shown in the Table below. *Brazil, China* and *Australia* have large reserves; *Newfoundland* has the third greatest reserve in the world and *Cuba* the fourth. The output of iron in *Chile* is increasing.

Principal Iron Ore-Producing Countries

In Thousands of Metric Tons.

1913		1930	
U.S.A.	62,975	U.S.A.	59,346
France	43,054	France	48,457
U.K.	16,254	U.K.	11,814
Spain	10,789	Sweden	11,236
U.S.S.R.	10,300	U.S.S.R.	10,236
Sweden	7,476	Luxemburg	6,649
Luxemburg	7,333	Germany	5,659
Germany	7,309	Spain	5,525
Austria	2,031	Algeria	2,232
Czechoslovakia	1,800	India	1,879
Cuba	1,607	Chile	1,721
Algeria	1,349	Czechoslovakia	1,653
Newfoundland	1,263	Newfoundland	1,197
		Austria	1,180

The industrial depression has resulted in an enormous decrease in the world production of iron-ore since 1930. In the United States, for example, the output of iron-ore in 1932 was less than 10 million tons; in France 27 million tons; in the United Kingdom, 7 million tons; and in Sweden 3 million tons. The output figures for 1930 have therefore not been brought up-to-date because they probably reflect "normal" conditions more truly than later statistics of production. An exception is found in the U.S.S.R., where the production of iron-ore in 1932 had risen to over 12 million tons, due to the development of the Five Year Plans.

Copper

Copper is widely distributed in veins in igneous and metamorphic rocks, but the commercial value of copper-bearing ores depends upon the amount of weathering and oxidisation which has taken place. "Native" copper (*i.e.*, the metal uncombined with other elements) occurs in some places, but it is difficult to obtain because the blasting of the enfolding rock causes the metal to melt and run. Amongst common substances copper is the best electrical conductor, hence the demand therefor has rapidly increased with the development of electrical undertakings. The world produced eight times as much copper in 1910 as in 1880, and, as the Table below reveals, the increase since has been remarkably rapid. Indeed, the need for electrical conductors is growing so rapidly that copper is, after iron, the most important of all commercial metals.

The *United States of America* is the only great *industrial* country which has large copper mines, and these exist in the western mountains and the Lake Superior region. The Chuquicamata deposits in *Chile* are larger than those of the United States—indeed, they are the largest in the world, while in *Peru* copper is the principal mineral. Europe has little copper outside *Spain* (where it is obtained from the well-known Rio Tinto mines), though small quantities exist in *Germany*

(Mansfeld) and *European Russia* (Urals). In *Japan*, the leading Asiatic producer, copper is obtained mainly from Honshiu and Shikoku. *India* produces copper at Bawdwin (Burma), but large quantities have to be imported.

The *Belgian Congo* has deposits, mainly in the Katanga district, while other African producers are *S.W. Africa* and *Southern Rhodesia*. *Canada* produces copper from *British Columbia* (50% of her total), *Ontario* (33%) and *Quebec* (17%). *Bolivia, Argentina, Venezuela, Siberia, Borneo* and *China* have large deposits which are slowly being developed.

Principal Copper-Producing Countries

IN THOUSANDS OF METRIC TONS.

1913		1930	
U.S.A.	604	U.S.A.	626
Japan	67	Chile	220
Mexico	44	Belgian Congo ...	140
Germany ...	42	Canada	138
U.S.S.R. ...	34	Japan	80
Spain	31	Mexico	74
Peru	28	Spain	59
Chile	20	U.S.S.R. ...	49
Canada	19	Peru	46
Belgian Congo ...	7	Germany ...	27

The 1930 figures are given for reasons previously stated, but there will probably be a change in the relative importance of the chief copper-producing countries because of the increased development of Empire resources. The United States no longer have so strong a hold on the world's copper trade, as they have lost some of their export markets to Canadian and African producers. So rapid has been the increase in production that in the near future the Empire will probably be in a position to supply about 50 per cent. of the copper requirements of the world.

Aluminium

Aluminium is comparatively a newcomer amongst the metals of commerce, for it was not until 1910 that it was sold at such a price as would permit of its use for ordinary household utensils. It is a better conductor of electricity and is also harder than copper but, as it will not bend easily without breaking, it can never replace copper for electrical purposes. Nevertheless, for strength and lightness combined, aluminium is superior to any other metal, and is now widely used in the manufacture of castings for motor-cars and aeroplanes.

The metal is obtained by fusing an ore known as *bauxite* (hydrated aluminium oxide) in an electric furnace with a substance known as *cryolite*. Because of the very high temperatures required for this process the production of aluminium is limited to regions where abundant water-power makes possible the provision of cheap electricity. Cryolite is found only in Greenland, but the same lot can be used repeatedly as it is necessary only as a catalytic agent in the process. Bauxite occurs mainly in S.E. France, Hungary, the United States, British and Dutch Guiana, Italy and Yugoslavia.

The principal aluminium-producing country is the United States (about 40 per cent. of the total world production), followed by Canada, Germany, France, Norway, Switzerland and the United Kingdom.

Lead

Lead is obtained almost entirely from ore known as *galena* (lead sulphide), which frequently contains silver and zinc. The lead ores of the world occur in about equal proportions in lodes (veins) and in masses in limestones. The United States normally produce about one-third of the world's lead, the principal areas of production being the Joplin district of Missouri, Idaho and Kansas, whilst large quantities are produced alongside silver in Idaho and Utah. *Australia* is the second producer and *Mexico* the third, production in Australia having actually increased by 50,000 tons between 1930 and 1933, despite a decrease in world production of 500,000 tons. Australian lead comes mainly from the famous Broken Hill mines of New South Wales and the Read-Hercules mines of Tasmania. *India* has deposits in Burma (at Bawdwin), *Spain* at Linares and Ciudad Real, and *Canada* in British Columbia (near Kimberley). *Germany* follows Canada as a producer, the lead being found mainly with zinc.

Zinc

Zinc is obtained from *zinc blende* (zinc sulphide), which usually occurs in conjunction with galena in lead ores. The United States normally produce over 40 per cent. of the world's supply of zinc, mainly from Joplin, Franklin Furnace and Butte. *Mexico* is the second largest producer, followed by *Australia*, *Germany* and *Poland*. The Australian deposits are found mainly at Broken Hill (N.S.W.), the Polish in Upper Silesia, and the German in Silesia, the Rhineland and the Harz Mountains. Other producers are *Canada* (in British Columbia), *Italy*, *India*, *Spain* and *Sweden*. The leading zinc-smelting countries are the United States, Belgium, Poland, Germany, France, Canada, the United Kingdom and Australia.

Tin

The only important ore of tin is *cassiterite* (tin oxide). Tin is obtained from veins or lodes frequently in association with wolfram, and as "stream tin" from alluvial deposits which have been weathered from veins. After concentration by washing and crushing the concentrate is smelted, when it yields about 60–70 per cent. of tin. The most important use of tin is in the making of tinplate, for the manufacture of which Swansea is the world's largest centre.

British Malaya produces about 30 per cent. of the world's tin, *Bolivia* 20 per cent., the *Netherlands East Indies* 17 per cent. and *Nigeria* and *Siam* about 5 per cent. each. Other producers are *China*, the *United Kingdom*, *Australia*, *Burma*, *South Africa* and *Belgian Congo*. The United States consume the largest quantity, owing to the extensive use of tinplate in the great packing, canning and other industries of that country. Great Britain and the Straits Settlements smelt 75 per cent. of the world's ore, of which 45 per cent. is from Empire sources, and 30 per cent. from Bolivia, Siam and the Netherlands East Indies. Tin smelting works were established in the United States during the War, and led to some falling off in the British output.

As a result of over-production and falling prices, the principal tin-producing countries have adopted a restriction scheme for marketing their output on a sliding scale basis of price.

Manganese

Manganese, commercially of great importance by reason of its use for toughening and hardening steel, is obtained from manganese ores and manganiferous iron ores. The *U.S.S.R.* is the chief producer, the centres being Georgia and the Nikopol district. *India* is the second largest producer, and, with better organisation and the careful selection of ores, the industry in that country has been greatly developed. "The ore is widely distributed in the Central Provinces, Madras, Bombay, Bihar and Orissa and Mysore, but the Balaghat and Nagpur districts of the Central Provinces are the chief contributors to the output. Large reserves are available, but the future of the industry depends to a large extent on its ability to face competition with Russia, where the costs of production under existing conditions are low ".[1]

There are several other producing countries, the most important being the *Gold Coast*, *Egypt* and *Brazil*. In Brazil poor organisation, labour difficulties, distance from the sea and bad transport are serious handicaps. The output of the United States rose to a high level during the War, but is normally relatively unimportant.

Chromium

This metal is obtained from compounds which occur in small grains in rocks. It is expensive to procure owing to the high proportion of waste rock which has to be handled and disposed of during the process of extraction. The metal is fused with iron as ferrochrome or reduced to bichromates for chemical purposes. Ferrochrome is used for hardening steel for armour plates and cutlery, and for making stainless steel. The principal producers are *Rhodesia*, *India*, *Cuba*, *New Caledonia*, *Portuguese East Africa* and *Greece*.

---

[1] *Survey of the Mineral Position of the British Empire* (H.M. Stationery Office, 1931).

Tungsten

Tungsten, or *wolfram*, is another metal which has recently become important because of its value in the production of high-speed steel. The principal producers are *China*, *Burma*, the *United States* and *Bolivia*, while a little is also mined in Cornwall.

Antimony

Antimony is obtained from the ore *stibnite* (sulphide of antimony). It usually occurs in veins in igneous rocks where they have been intruded into older rocks. It is used for anti-friction alloys and printers' type metal, and for hardening other metals. *China* produces 80 per cent. of the world supply. France, Bolivia, Mexico, Germany, Yugoslavia and Algeria are small producers.

Quicksilver

Quicksilver, or *mercury*, is a liquid metal used in the making of scientific instruments, in the extraction of gold and silver from their ores, and in medicine. The principal mines are in *Spain* (New Almaden) and *Italy* (Idria), but it is produced also in the United States, Czechoslovakia, Peru and Mexico.

Nickel

Nickel, which is used in steel making, plating and coining, is obtained almost entirely from *Canada* (Ontario), which produces nearly 90 per cent. of the total world supply. Of the remaining world output New Caledonia produces about 7 per cent.

THE PRECIOUS METALS

Platinum

Platinum, found mainly in alluvial deposits in combination with other rare metals, is one of the heaviest metals known and is almost indestructible. It is mainly used for delicate instruments in electrical and chemical work. The *U.S.S.R.* produced 85 per cent. of the pre-war supply, and is still the principal producer, although the great Ural deposits are exhausted. *Colombia* is the second in importance at present, the output being about one-third of that of the U.S.S.R. *Canada* and *South Africa* have an increasing production, while *Australia* and the *United States* have very small outputs.

Gold

Gold is highly valued because of its great utility and its comparative rarity. It is one of the most beautiful metals and is very durable, hence it is not only very popular for ornamental articles but has been used as the standard of currency in many countries. It occurs in reefs or lodes generally associated with igneous rocks. Ores of this kind have to be crushed before the gold can be extracted, and thus a large capital outlay is needed to work the deposits. In South Africa gold is finely disseminated through the mass of an ancient conglomerate, known as the " banket " conglomerate. Here, also, the banket must be crushed, and the gold extracted by chemical means (the " cyanide process "). In some areas gold is often found native, *i.e.*, more or less pure, in alluvial deposits called " placers " washed down by streams from a gold-bearing region, and in these circumstances the nuggets and gold dust can be obtained easily merely by washing or panning the earth or gravelly deposits. This is the primitive method and requires little capital outlay.

The British Empire dominates the world production of gold, supplying about 70 per cent. of the total.

AFRICA. *South Africa* accounts for over 50 per cent. of the world supply of gold, the total value of the metal produced in the Union up to 1933 being over £1,200 millions, of which all but a very small fraction came from the Transvaal. The *Transvaal* is, indeed, by far the greatest gold producer in the world, the main gold-mining region of conglomerate reefs lying in the eastern end of the Witwatersrand (the " Rand "), in a district extending some 50 miles to the east and west of Johannesburg, the great centre of the industry. Less important gold centres in the Transvaal are the quartz reefs in the Pilgrim's Rest, Barberton, Heidelberg and Klerksdorp districts. All the Transvaal mines are worked by large companies, and, as there are no alluvial diggings in the Union, the opportunities for the private prospector are small. *Rhodesia* has widely distributed gold reefs, the most important centre being the south-eastern watershed of the river Zambesi in Southern Rhodesia. The *Gold Coast* and the *Belgian Congo* also are

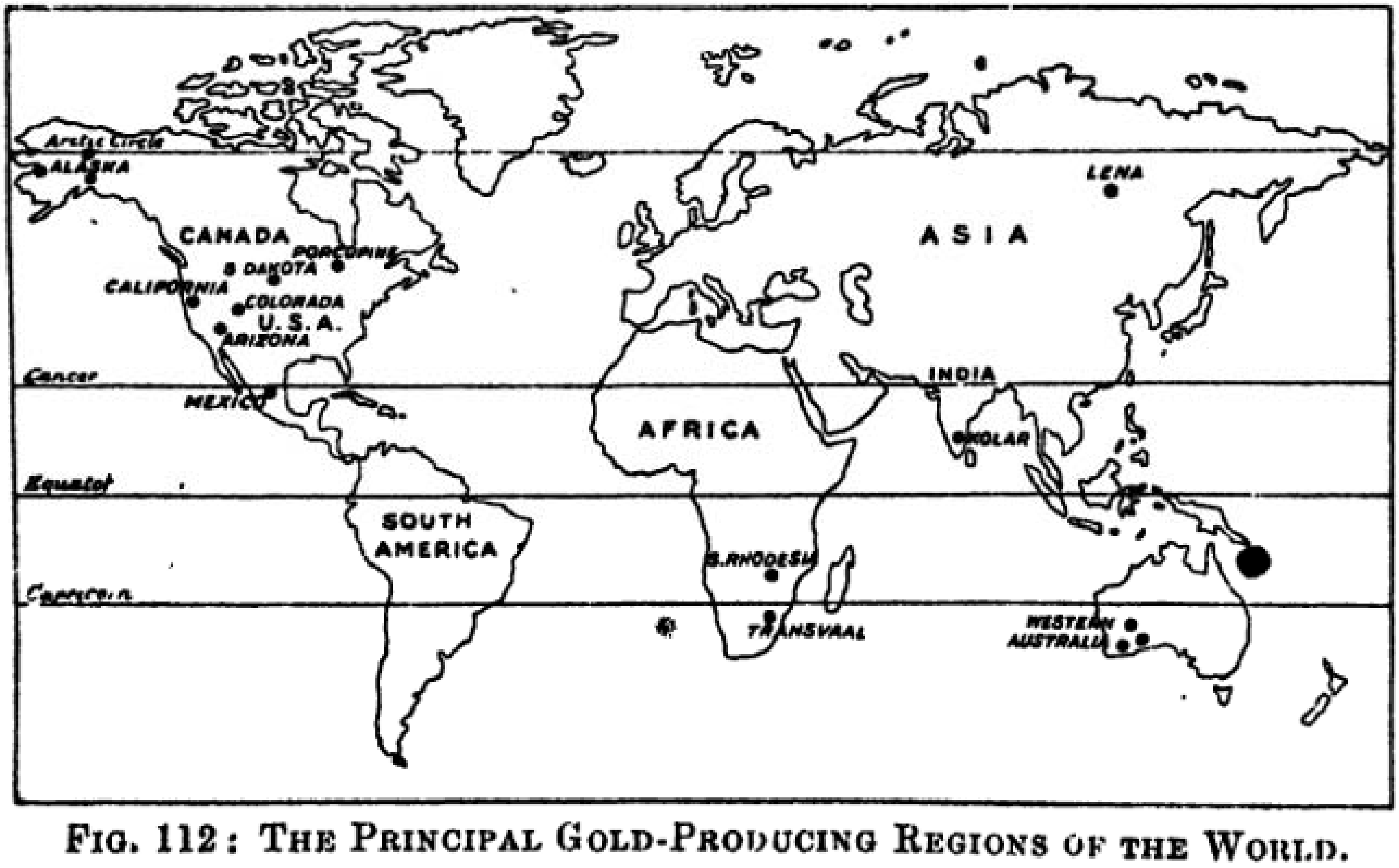


FIG. 112: THE PRINCIPAL GOLD-PRODUCING REGIONS OF THE WORLD.

roducers, whilst new deposits are being worked in *Sierra Leone*, *Nigeria*, *enya* and *Tanganyika*.

AMERICA. The *United States* are third in importance of the gold roducing countries, but production is declining. In 1932 the principal centres were California, Alaska, South Dakota, Colorado, Utah and Nevada. In *Canada*, which is second to South Africa as a gold producer, gold is found in all the provinces except New Brunswick and Saskatchewan, but the greatest producer is Ontario, which supplies about 80 per cent. of the total. Here the chief centres are Kirkland Lake and Porcupine. The Hollinger Mine of the Porcupine district is now the greatest gold-mine in the world. About 8 per cent. of Canada's gold is obtained from British Columbia, mainly from the Rossland and Nelson districts. Quebec supplies 6 per cent., mainly from gold-copper ores, and the Yukon 2 per cent. of the total. In *Mexico*, gold is found mainly with silver on the plateau. In South America *Brazil*, *Peru*, *Colombia*, *Ecuador*, *Venezuela* and the *Guianas* are the principal producers.

[*By courtesy of the Publicity Dept of the Commonwealth of Australia*

SLUICING FOR GOLD IN VICTORIA.

Water for this and other purposes may have to be carried in pipe lines for miles or may be obtained from artesian bores

Australasia. In 1932, *Australia* was fifth in importance of the gold-producing countries and the output is steadily increasing. The rich placer mines and alluvial deposits have long been worked out, and the ore is now obtained by means of shafts sunk deep in the earth. The principal centres are in Western Australia (East Coolgardie, Kalgoorlie, St. Margaret, Yilgarn and Murchison), which account for about 90 per cent. of the total output of Australia; Victoria (Ballarat and Bendigo); Queensland (Mt. Coolon, Gympie, and Ravenswood); and New South Wales (Bathurst). Smaller quantities are obtained from Tasmania, Central Australia and South Australia. *New Zealand's* production of gold shows a steady decline. Here the gold bearing areas are in the Thames-Waihi district of Auckland, the Reefton district on the west coast of the South Island and the Central Otago region.

Asia. The *U.S.S.R.* is by far the largest producer in Asia, the chief area of production being the Lena Goldfields, which lie north of Lake Baikal in Siberia. *Japan* and *Corea* have together a larger output than India. In *India*, the deposits are at Kolar in Mysore, which has the only important goldfield of the country. Other Asiatic producers are the *East Indies*, *China*, the *Philippines* and *New Guinea*.

Europe. *Rumania* has a small gold output.

Principal Gold-Producing Countries

in Millions of Troy Ounces

1913		1932	
South Africa	8·4	South Africa	11·6
U.S.A. ...	4·2	Canada ...	3·1
Australia	2·2	U.S.A. ...	2·0
U.S.S.R.	1·3	U.S.S.R.	1·7
Mexico ...	·9	Australia	·7
Canada ...	·7	Mexico ...	·6
S. Rhodesia	·6	S. Rhodesia	·6
India ...	·4	Japan ...	·4
Japan ...	·3	India ...	·3

The aggregate world production in 1913 was 22·3 million troy ounces and in 1932 about 23·7 million troy ounces. As compared with 1913 the chief features of the output in recent years are the decline in the production of Australia and the United States and the increase in the production of Canada and the U.S.S.R.

Silver

Nearly all the world's silver is obtained from lead ores, especially galena, where it occurs as an impurity. Since 1893 the yearly output has fluctuated between 160,000,000 and 400,000,000 ounces. Silver is used for coinage purposes, for jewelry and the arts, and for electroplating.

North America produces about 75 per cent. of the total world output of silver. *Mexico* is the leading producer, the silver mines in that country being widely distributed. The *United States* are second, their principal centres being Utah, Idaho, Montana, New Mexico, Arizona, Colorado and Nevada. *Canada* is third, with mines at Cobalt, Gowganda and South Lorraine in Ontario, and in the Kimberley and Portland Canal districts of British Columbia. The Yukon also is a producer and a recent discovery of lead-silver deposits will result in increased output from this territory.

CENTRAL AMERICA has large reserves of silver, and there is much room for development. At present, *Honduras* and *Guatemala* are the leading producers.

SOUTH AMERICA. *Peru,* in the Andean region, is the principal producer, followed by *Bolivia* and *Chile.*

ASIA. *Burma* is the largest Asiatic producer, the output being obtained from the lead-silver-zinc deposits at Bawdwin. *Japan* and the *Dutch East Indies* are other Asiatic producers.

AUSTRALASIA produces silver mainly from New South Wales (Broken Hill) and Tasmania (Read-Hercules), but there are deposits also in Western Australia (Kalgoorlie), Queensland and South Australia.

EUROPE. *Germany* obtains silver from the Beuthen zinc mines in Upper Silesia, while *Spain* has a small output mainly from the Guadalajara province of New Castile.

Principal Silver-Producing Countries

IN MILLIONS OF TROY OUNCES

1913		1932	
Mexico	70·7	Mexico	72·0
U.S.A.	67·9	U.S.A.	24·0
Canada	31·8	Canada	18·4
Australia	17·3	Peru	13·2
Peru	9·6	Australia	8·0
Germany	6·1	Germany	5·7
Japan	4·7	India	5·0
Spain	4·3	Japan	4·5
Bolivia	2·8	Bolivia	4·1
India	·1	Spain	2·5

PRECIOUS STONES

These are rare and beautiful minerals, extremely hard, lustrous and often transparent. They occur in igneous or metamorphic rocks, or in alluvial gravels derived from these rocks.

DIAMONDS are composed of pure carbon in the crystalline form, and are harder than any other known natural substance. *The Union of South Africa* contributes 50 per cent. to the world's supply, and the African continent produces 80 per cent. of the total world production. Other individual producers are *Brazil*, the *Belgian Congo* and the *Gold Coast.*

[By courtesy of the High Commissioner for South Africa.

THE PREMIER DIAMOND MINE AT PRETORIA.

Rubies are red stones found mainly in *Burma*, but also in *Ceylon* and *Siam*.

Sapphires are translucent forms of alumina which occur with silver in *Burma, Ceylon* and *Siam*.

Emeralds are precious stones of a beautiful green colour. The entire world supply comes from *Colombia*.

OTHER MINERALS

Asbestos

Asbestos is a fibrous mineral the supply of which is almost a monopoly of *Canada*, where Ontario, in the Thetford and Danville areas, produces 65 per cent. of the world total output. Other sources are *Rhodesia, South Africa* and the *U.S.S.R.* Asbestos is in demand as a fire resister, for gas stoves, for decorations and for many other purposes.

Salt

Although salt is universally used and is of great importance to mankind, very litt[illegible] enters into international trade, mainly because of its wide distribution and consequent cheapness. It is obtained from rock salt mines, from brine pits or brine wells, and from the evaporation of sea water. The principal producers are the *United States, China, Germany*, the *U.S.S.R., France*, the *United Kingdom, India, Spain, Italy, Japan* and *Poland*. As salt is the only mineral used as food, it is particularly important. In India, for example, it is a government monopoly and is taxed.

BUILDING MATERIALS [1]

Timber

For forest and woodland growth there must be evenly distributed or heavy rainfall, but, even where the rainfall is comparatively light, there may exist some counterbalancing local circumstances, such as water-bearing sands or gravels, which permit of tree growth. As a result, forests and woodlands are widely distributed (*see* Figs. 84, 87 and 113), and it is only in the tundra, steppe and desert areas that trees are entirely absent. The forested area of the world amounts to nearly 7,500,000,000 acres, of which by far the greatest proportion is to be found in the Temperate Zone of the Northern Hemisphere.

Woods for commercial purposes are divided into (*a*) timbers used as building and constructional material; and (*b*) ornamental woods used mainly for panelling and furniture. The woods in each of these groups are again divisible according to their structure into "soft" woods and "hard" woods. The soft woods come from coniferous trees, which grow mainly in the Cold Temperate Zone and so give to that zone the alternative name by which it is known geographically, *i.e.*, the Coniferous Forest Zone. The hard woods are obtained from the temperate zone, south of the coniferous belt, and also from tropical countries.

---

[1] Iron, which has already been dealt with as a mineral, is not included in this classification, but its use as a building material should not be overlooked.

The most important coniferous trees are pines, firs, larches and spruces. The temperate hard woods include oak, ash, elm, beech, jarrah and karri, while the tropical woods include teak, mahogany, rosewood and ebony. Four-fifths of the timber consumed in the world consists of soft woods, which are being rapidly exploited and will be gradually exhausted. A vast amount of timber is made into *pulp* for use in the artificial silk industry and the paper industry; *dyes* are obtained from trees such as Brazilwood, camwood, fustic and logwood; while *tanning materials* are extracted from a number of trees, including the chestnut, oak, mangrove, quebracho and wattle.

In spite of the enormous extent of the forested area of the world, there is even now evidence of a shortage of timber. The reasons for this are the bulky nature of timber and the increasing remoteness of the forests from the regions which need it. The weight of timber confines forest exploitation to regions which are near to navigable waterways, since the timber--being of low value in proportion to its bulk—cannot bear the cost of land transport over great distances. Even the utility in this respect of first-class rivers may be discounted if the rivers flow into ice-bound seas, as do the Mackenzie in Canada and nearly all the great rivers of Siberia. Further, water-power is essential for driving the machinery which saws up the logs or converts the wood into pulp, as these processes require such vast power to overcome the enormous resistances as to preclude the economic use of any source of power other than water. In the United States, for instance, two-thirds of the water-power in use is employed in the pulp mills. The result of these factors is that extensive areas of forest land remain untouched. In regions not too remote from markets, wood-distillation is carried on and the products, such as wood-alcohol, are despatched by rail.

North America has hitherto been a great source of commercial timber, but the supplies have been used so quickly and with so little foresight that the forests are rapidly becoming exhausted. Extensive damage through forest fires has been a contributory cause of exhaustion, and in Canada, particularly, the forest States have organised special departments to cope with such fires. As soon as an outbreak occurs warning is at once flashed by authorised watchers to responsible quarters, whence chemical and other extinguishers are immediately rushed up by railway and aeroplane.

In *Canada* the forests consist almost entirely of coniferous trees and the chief forest products are therefore lumber and woodpulp. The principal lumbering regions are British Columbia, Quebec, Ontario and New Brunswick, in each of which lumbering is an important winter occupation. The logs are drawn over frozen and snow-packed " roads " to the rivers to await the spring floods, when they are carried at little expense in the form of rafts to sawmills where water-power and facilities for further transport are available. Canada, with her abundant forests, extensive supplies of water-power and splendid transport facilities, is most important as a wood-pulp and paper producing country, and has a large export of lumber products to the United States and to a less but still important extent to Britain.

Newfoundland, with the same advantages as Canada, has also an important pulp and paper industry, the products of which are very largely exported to Britain.

The lumbering centres of the *United States* are now in the north-west, for the eastern timbers of New England, the Gulf States and the Lake States are becoming exhausted. Washington is the principal lumbering State, and the Douglas fir and the Yellow pine the chief trees. The Gulf States produce pitch-pine. The wood-pulp industry is important, the chief centres being in the north-east States. Spruce is the most widely used timber in the United States' pulp industry, but as supplies are rapidly becoming exhausted, there is a large import of wood-pulp from Canada.

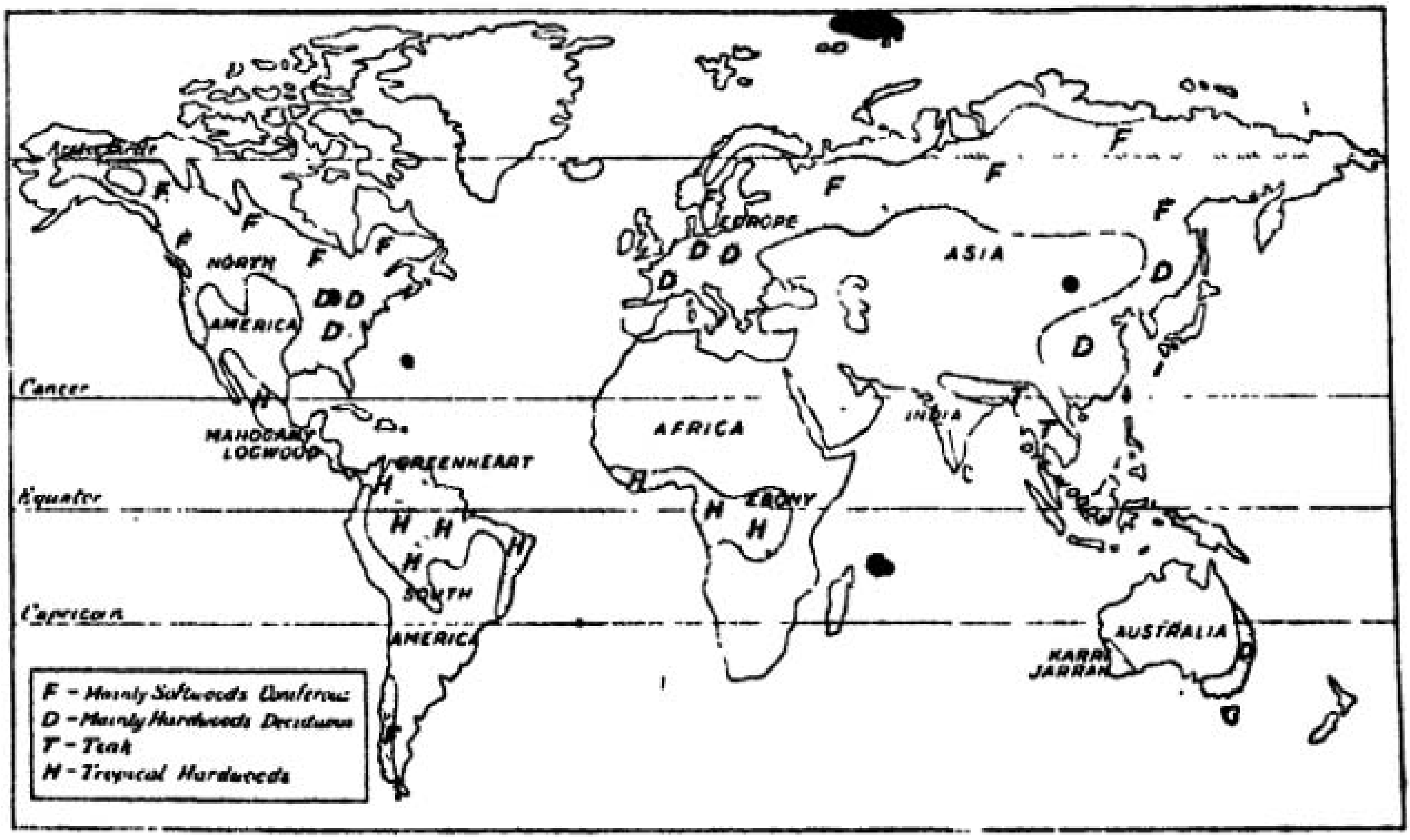


FIG. 113 : THE PRINCIPAL WOODLANDS OF THE WORLD.

SOUTH AMERICA has much hardwood (*e.g.*, mahogany and logwood) in the vast equatorial forest region of *Brazil*, but it is almost entirely undeveloped. Softwoods are worked in the extreme south in *Southern Chile.*

Africa is not very important for commercial timber, although valuable cabinet woods are exported from *West Africa*. The equatorial region is forested similarly to the equatorial lands of South America.

The U.S.S.R. *Siberia* has the largest timber reserve in the world, mainly in the Taiga or coniferous forest of the north, but over 40 per cent. of Russia's vast reserves of about 1,600 million acres are at present non-exploitable owing to the severity of the climate and inaccessibility, whilst large areas have poor quality timber because of the swampy nature of the surface. Despite the disadvantages, the U.S.S.R. is one of the great timber-exporting countries and sends a large proportion of her total exports to Great Britain.

Asia. *India* has large areas of forest, mainly in Burma but also in Assam, the Central Provinces, Madras, Bombay and Bengal. Teak is the most important timber used in shipbuilding because it contains an oil which tends to preserve iron from rust. It is obtained principally from Burma, where the trees are felled in large numbers and floated down the Irawadi to the sawmills at Rangoon, from which port the timber is exported in large quantities to all parts of the world, especially to Britain, which takes nearly 75 per cent. of the total timber exports. The amount of timber exported from India and Burma, however, is small compared with the quantity cut and used for home consumption. *Japan* has about 40 million acres of forest. She has commenced to manufacture wood pulp and the output is increasing rapidly. *Siam* is an important source of teak.

Australia is on the whole too dry for tree growth, but there is a considerable export of valuable and distinctive woods, such as jarrah (a species of eucalyptus used in the construction of harbours and docks) and karri (used to make wooden blocks for street paving) from Western Australia, together with iron bark and blue gum (used in harbour works) from the Eastern Highlands. Australia is short of soft woods, such as those used for house building, and large quantities are imported annually, but she obtains good timber from her various species of eucalypts, which have the advantage of rapid growth.

New Zealand also imports timber, but has an export of several thousand tons of an important timber product known as " kauri gum," which is much in demand for the manufacture of fine varnishes. The gum is obtained from the ground in which trees have rotted away and left behind a deposit of the " fossilised " gum.

Europe. The Scandinavian countries are the principal sources of European timber. *Sweden* is particularly important, with 57 million acres, or over 56 per cent. of the country under forests, and her wood and paper industries are easily the most valuable occupations of her people. Timber and timber products are widely exported in large quantities. The rivers flowing into the Gulf of Bothnia provide cheap power and transport and, as they drain the forest areas, large numbers of saw and pulp mills are situated along their banks.

In *Norway*, also, the forests are the chief natural source of wealth, and although much of the country is mountainous and barren, about 24 per cent. of the total area or nearly 20 million acres (70 per cent. pine forests) are forested. Fortunately, the country has open harbours all the year round and has, in addition, the same transport facilities as eastern Canada, with the result that timber, wood-pulp and paper constitute about one-third of the total exports.

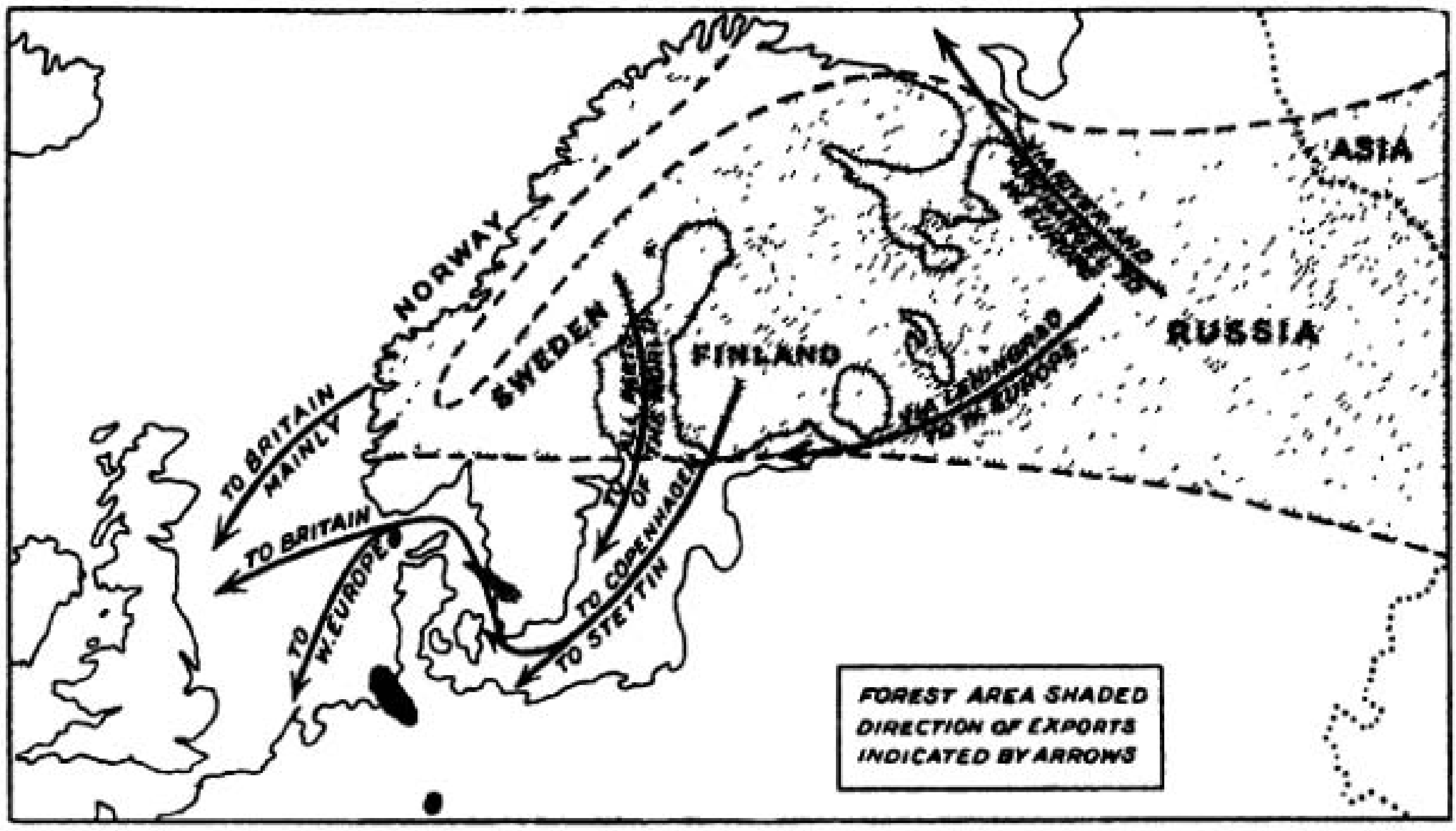


FIG. 114: THE CONIFEROUS FOREST AREA OF EUROPE.

Finland has over 60 million acres of forest land (over 70 per cent. of the total area) and, of these, nearly 50 million acres are either already productive or capable of development. This abundant timber supply, added to water-power and river transport, has given rise to an important industry, and timber, wood-pulp and paper are exported in large quantities.

Bricks

Bricks are made from clay which, after moistening with water, is moulded into shape and baked in kilns. Bricks have been made for constructional purposes since the very earliest times, and remains of brick buildings occur in many parts of the world where ancient civilizations once existed, especially in the more arid regions where timber was not available.

In modern times, the manufacture of bricks is a local industry, because the low value of the product in relation to its own weight and bulk and in relation to the weight and bulk of the materials—clay and coal—required for its manufacture, makes long distance transpor either of product or raw material too expensive. Although different varieties of clay from different geological formations give rise to different kinds of bricks, clay suitable for brick-making purposes is widely distributed and can almost always be obtained on or in close proximity to the coalfields. Hence, there is a tendency for brick-making to be carried on as near as possible to coal supplies, although in cases where beds of suitable clay are found near to important marketing centres for bricks, *i.e.*, large and growing centres of population, it pays to transport the coal for some distance because there is a saving on the carriage of the bricks produced.

An outstanding example of the importance of proximity to the market is the brick-making industry of Peterborough—the largest centre in England—where the industry depends on deposits of suitable Oxford clay, and on the easily accessible and large market in London. Likewise the clays of the Hudson Valley in the United States are largely worked for bricks, and a considerable barge traffic exists on that river for transport to the thickly populated urban areas.

Fire-clay is a clay which contains little or no lime. It is therefore almost infusible and is made into fire-bricks and linings for furnaces. Fire clay is worked in England at Wortley, near Leeds in Yorkshire, at Shipley near Bradford and at Stourbridge in Worcestershire. All these fire-clays occur at the base of the coal measures, and conveniently provide raw material for the manufacture of fire-bricks for the adjacent iron-working areas.

Stone

The harder geological formations of igneous, sedimentary and metamorphic rocks provide the stone used for buildings, paving, road making, harbour construction and the like. Few countries are without some stone that is suitable for building purposes, but some are much more favourably endowed than others. Russia is poor in stone, and this poverty was one factor which influenced Peter the Great in establishing the city now called Leningrad, not in the interior of his vast Empire, but on the coast in such a position as to enable him to use for its buildings imported stone carried by sea. The Mediterranean countries are rich in stone, and to their abundant outcrops of easily worked and in some cases beautiful stone (*e.g.*, marble) we owe the heritage of architectural art which was left to us by the builders of Greece and Rome.

Building stone is much more expensive to use than brick, because of the extra labour involved in quarrying and shaping, or in fitting rough stones together in the wall. Again, as stone is heavy and bulky it is costly to transport, and only those stones which possess special properties (e.g., granite, both beautiful and lasting) or high value relative to their bulk (*e.g.*, marble) are transported any great distance.

Plutonic or igneous rocks are hard and entirely crystalline. They are capable of taking a high polish and are used mainly for ornament. Of these the most typical and important is granite, which is quarried at *Aberdeen*, *Shap*, *Cornwall* and *Wales*. Some granites are imported, notably a beautiful dark rock with irridescent blue crystals from *Norway*. Granites occur also in *France*, *Czechoslovakia*, the *Alps*, the *Balkan Peninsula* and other regions. Lava—the solidified efflux from volcanoes—is used as road metal. The black basalts and dolerites occurring in various parts of Britain are quarried extensively for building purposes, notably from the Giant's Causeway in *N. Ireland*, the Whin Sill and the Cleveland Dyke in *North Yorkshire*, and the Rowley Regis Hills in *Staffordshire*. These stones are known to quarrymen as " whin stone " to distinguish them from the more coarsely crystalline granites.

Sedimentary rocks provide general building stones, but only those stones which are capable of being shaped and worked easily without splitting are of value. The most important are limestones, many of which become very hard after exposure to the air. In Britain, the oolitic rocks are pre-eminent and provide the finest building stones, including Bath stone, Portland stone, Barnack, Ketton and Weldon stones, all found on the *Northamptonshire* and *Rutland* borders. In *France*, Caen stone is equally famous, while in the United States the Bedford oolite (Indiana) is largely quarried.

The Chalk and Wealden rocks of south-east England contain scarcely any building stone of value except flints, and these are not suitable for decoration. For this reason it was that the cathedrals of this part of the country (Canterbury, etc.), were built by the Normans of Caen stone brought by them from Normandy by sea. (Caen stone is the counterpart of our Portland stone). Likewise, the absence of building stone in East Anglia accounts for our having so many flint churches in that area, and for the existence of so many round towers—for flint does not lend itself to straight-line architecture. Churches of wood, too, are common though this was partly due to the proximity of forests (Epping, etc.).

Sandstone, another sedimentary rock, is also largely used for building purposes—the coarser stone or grits for foundations and viaducts, and the fine sandstones for houses and other buildings. Most of the industrial towns of Yorkshire and Lancashire are built of local stone from the millstone grit and coal measures.

The only metamorphic rocks used commercially are slate (*see* p. 154) and marble. Marble is limestone which has been subjected to enormous pressure and hardened, and by reason of its beautiful appearance is widely used for ornamental purposes. The best white statuary marble comes from Carrara in *Italy* which, with Siena, also provides coloured marbles. The *United States* possess many marble deposits, one of the greatest quarrying areas in the world being at Rutland (South Vermont). *Britain* has no marbles of importance, though stone is quarried in

Purbeck, Durham and Sussex which goes by the name of marble for commercial purposes. *Italy* is the world's greatest producer of marbles and exports are sent to both England and America mainly for memorial purposes and internal decoration.

Cement

Cement is made from limestone, sand and burnt clay, although in the best cements finely powdered slate waste is used. Cement suffers from the same disadvantage as bricks and stone, in that the great bulk and weight of the commodity make unprofitable its transport for any great distance, except by sea. This factor tends to locate cement-making either near its market or at places where the several materials are found together. Nevertheless, the quality of British cement is such that the annual exports from this country reach a value of over one million pounds sterling.

The most important cements of commerce are those known as "Portland" cement and "Roman" cement. The Portland cement industry is based on the limestone quarried at Portland. Roman cement is made from calcined and ground limestone with silica, alumina and iron oxide. The manufacture of cement is especially important in the chalk country of North Kent and along the chalk escarpment of the south-east Midlands.

Cement mixed with gravel makes *concrete,* and when strengthened with steel rods is known as *reinforced concrete,* a material the use of which for building purposes is rapidly extending and so causing an ever-increasing demand for cement. Despite this demand, over-production of cement led to a decline in its price whereas the prices of steel, iron and timber increased. This, in turn, still further encouraged concrete construction and cement production, especially in the United States, where the present period is sometimes spoken of as the "cement age."

Slate

Slate is one of the very few metamorphic rocks used in commerce. The great heat and enormous pressure to which these rocks have been subjected by earth movements have given slate the property of cleavage, *i.e.,* it can be readily split into very thin flat sheets, which serve a number of useful purposes. They are especially valuable for roofing, by reason of their imperviousness to moisture and their resistance to the weather, but they have been largely superseded by tiles.

Slates occur in many parts of the world, but commercially they are more important in *Great Britain* than elsewhere, and Britain produces nearly 50 per cent. of the world supply. The *United States*, *France* and *gium* are next in importance.

British slates are grey, purple or green in colour. In Scotland, Ireland, Devon, Cornwall and the Lake District slates are quarried for local use only, but in North Wales they are quarried on a large scale for export. The heavy, bulky nature of slate makes rail or road transport expensive, but it is found profitable to send small shiploads direct from Welsh ports to their destination because of the saving effected in handling and transhipment. In return, cargoes of raw materials, such as timber, pulp and fruits can sometimes be carried.

The Festiniog, Llanberis and Penrhyn slates of North Wales are shipped from Portmadoc and Bangor to all parts of Britain and to Germany, where they are used largely for roofing purposes, as well as in the manufacture of cisterns, sanitary fittings and dairy fittings. The finely powdered dust from slate waste is very valuable in the manufacture of fine cement, distemper, special kinds of bricks, pottery and coloured glass bottles.

Glass

Glass is made from fused silica, a substance which occurs in all sand and sandstones. To effect the fusing the silica is heated with a substance known as a *flux*, soda being most commonly used for this purpose. Sometimes potash is used, though this gives rise to a somewhat different type of glass, while many other varieties are produced by the inclusion of other substances during the fusing process. Pure white sand consists of nothing else but tiny grains of quartz (the crystalline form of silica), and thus the suitability of sand for glass-making depends on its whiteness or purity. Sands are distributed very widely over the earth's surface and occur in all countries, but the finest kinds, known as glass sands, are comparatively rare. Very fine glass sands have been worked at various times in *England* at Lynn (Norfolk), Alum Bay (Isle of Wight), Hastings and Leighton Buzzard. In *France* such sands occur at Fontainebleau, and in the *United States* west of Massachusetts are found the finest possible sands for glass-making purposes.

Glass manufacture is nearly always carried on near coalfields, where the necessary suitable fuel and other materials are obtainable —*see* Chapter 14.

RUBBER AND TOBACCO

Rubber

Rubber, or caoutchouc, the solidified juice, sap or latex of a number of tropical trees, has become the most important commercial product of the equatorial forest regions. The rubber of commerce is obtained largely from the plant *hevea brasiliensis*, the product of which is known commercially as " Para " rubber. The plant is a native of the equatorial Amazon forests.

Other varieties of less importance are Ceara rubber (*manihot glaziovii*), African rubber (*funtumia elastica*) and Central American rubber (*castilloa elastica*). Until comparatively recently the world's rubber supply was collected mainly from the trees growing wild in the equatorial forests of South America and Africa, but exhaustion followed the wasteful methods of tapping the trees and the rapidly increasing demand for rubber for industrial and commercial purposes led to its introduction, after considerable difficulty, into Malaya and Ceylon as a plantation product, with such success that to-day plantation rubber provides nearly the whole of the world supply.

The rubber tree requires abundant heat and constant moisture. The Para variety needs a well-distributed minimum rainfall of 70–75 inches per annum, and a temperature of not less than 75°F. at any time of the year. The soil should be alluvium and well-drained, and the ground needs careful digging and weeding. Ceara rubber trees will grow in regions where the minimum rainfall amounts to 40 inches per annum, and, provided the ground is well-drained, a rainfall of from 100–200 inches per annum does not harm the tree. A damp climate is desirable, and the tree will flourish in temperatures of 70°–90°F. The African rubber tree flourishes in the moist tropical forest regions, the most suitable soil being red clay.

PREPARATION OF COMMERCIAL RUBBER. When the rubber trees have obtained from four to eight years' growth, they are "tapped" by making an incision in the bark, and at the base of the incision a metal spout and collecting cup are placed to collect the latex, which appears as a viscous, milky fluid. Once a day the latex is collected and taken to the rubber factory where it is coagulated by one of several methods which are available. Of these, the most important are by means of acids (acetic acid being the most common); by spontaneous combustion; by immersing the latex in a vessel in boiling water; or by diluting with water. After coagulation, the rubber is dried, usually by what is known as the "smoke-dried process", in which the rubber is hung for a period in a smoke-chamber. The dried rubber constitutes the raw rubber of commerce, and when ready it is packed and shipped to the consuming centres, where it is utilised for a great variety of purposes.

Rubber first became important commercially with the discovery, in 1839, of vulcanisation, a process by which raw rubber is converted into a far harder and more durable substance by being amalgamated with flowers of sulphur. In this way *vulcanite* is produced, whilst the inclusion of a higher proportion of sulphur yields the hard black material known as *ebonite*.

It is impossible to enumerate all the uses to which rubber is now put. It has been put to commercial, mechanical and domestic uses, and—to name only a few of its applications—is widely used for surgical, sports, motoring and electrical purposes. The United States have by far the greatest rubber manufactures, and are followed by France, Germany, Great Britain, Canada and Italy, all of which countries have important exports of the manufactured article.

[*Photo by W. F. Taylor.*

TAPPING A RUBBER TREE IN SIERRA LEONE, W. AFRICA.

It is the duty of this man to go about the rubber plantation and gather up the latex that has dropped into a cup placed at the base of the tree. If the sap is not running he induces it to do so by paring off a thin slice of the bark with his knife. The fluid thus collected is taken to the factory close by [illegible] prepared for exportation.

Production of and Commerce in Rubber

ASIA. *British Malaya* and the *Netherlands East Indies* supply the bulk of the world's commercial rubber. In 1932 British Malaya produced over 50 per cent. and the Netherlands East Indies about 30 per cent. of the total world production. Other Asiatic producers are *Ceylon*, *British Borneo* and *Sarawak*, *India*, *Indo-China* and *Siam*.

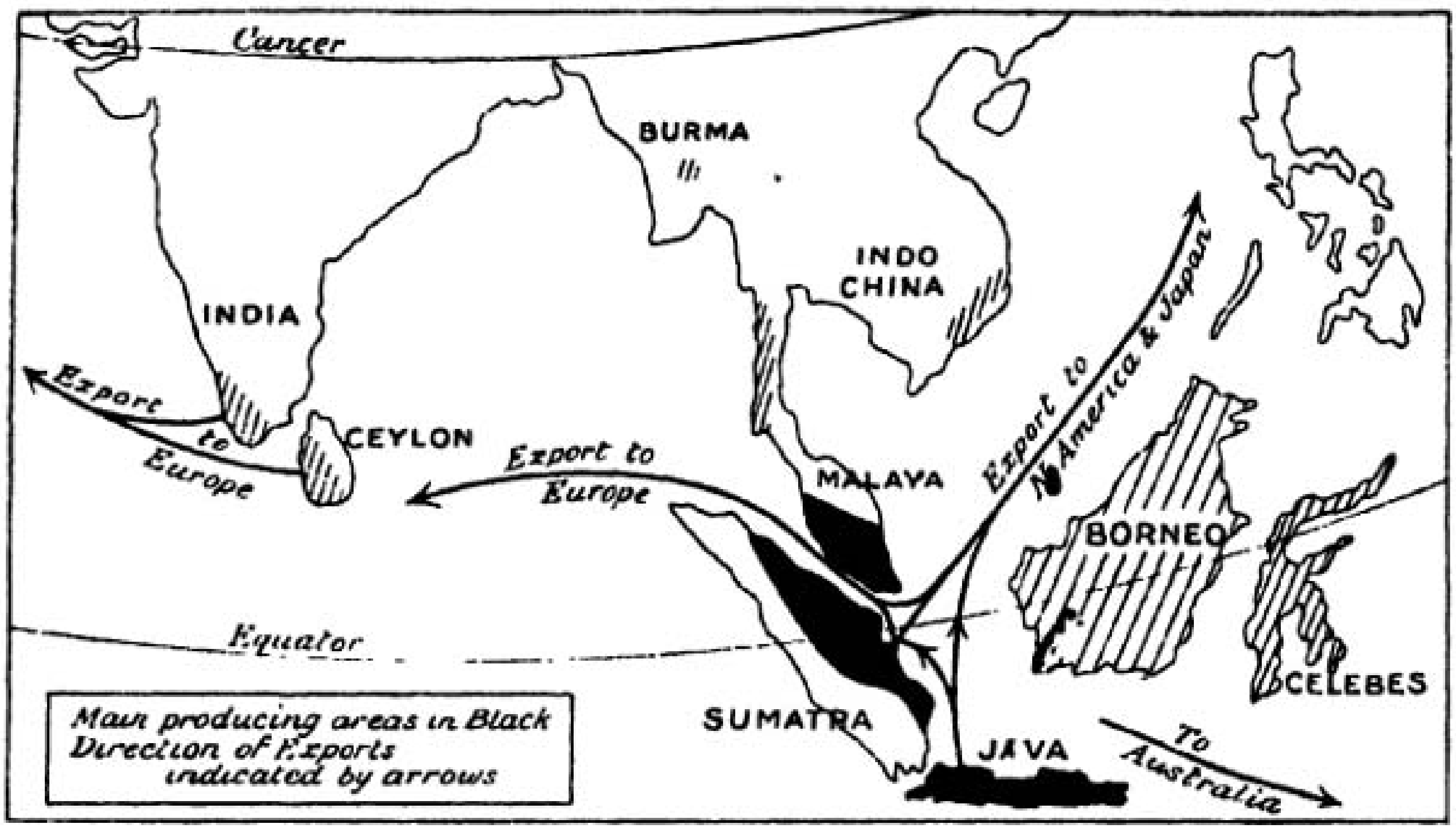


FIG. 115.—ASIATIC RUBBER PRODUCERS.

SOUTH AMERICA. *Brazil* produces the bulk of the South American supply, but whereas that country was some years ago the world's leading producer she now produces less than 3 per cent. of the world total. There is, however, a tendency for the output to increase owing to the recent development of plantation rubber.

AFRICA, too, now produces very little commercial rubber—less than 1 per cent. of the world total, but as in the case of Brazil, the development of plantation rubber in West Africa will give an increased output.

Production of Rubber

IN THOUSANDS OF METRIC TONS

	1913		1929	1932
Brazil	39	British Malaya...	458	417
British Malaya..	33	N.E.I.	263	254
Ceylon	11	Ceylon	82	111
N.E.I.	5	Brazil	23	17
British Borneo	1	British Borneo	18	1[illegible]
India ...			13	8
		Indo-China ...	10	14

The commerce in rubber of the principal countries is summarized in the Table below, which reveals probably more clearly than the pre-
Table the great increase in the world production of rubber
manufacturing industries in Japan.

and the U.S.S.R. in recent years, despite the world depression, is revealed by their increased imports of raw rubber since 1929.

Commerce in Rubber

IN THOUSANDS OF METRIC TONS

Exports.					*Imports.*				
	1913		1929	1932		1913		1929	1932
Brazil	38	Malaya	422	386	U.S.A.	47	U.S.A.	523	396
Mexico	6	N.E.I.	301	242	U.K.	20	U.K.	109	34
N.E.I.	5	Ceylon	76	51	Germany	15	France	68	46
Sarawak	5	Brazil	20	6	U.S.S.R.	9	Germany	50	46
Ceylon	5	India	12	4	France	5	Canada	36	21
Bolivia	4	Sarawak	11	7			Japan	35	57
Congo	4	Indo-China	10	15			U.S.S.R.	13	31

The available supplies of rubber have indeed been so large during the last decade that restriction schemes have been resorted to in an endeavour to increase the price of raw rubber. The latest restriction scheme came into operation in May, 1934.

Tobacco

Tobacco, now so widely used for smoking, is composed of the dried and cured leaves of certain species of the plant genus *nicotiana*. It is used for other purposes besides smoking and chewing, however, for the active principles which it contains are valuable in medicine and in making insecticides for the protection of plants and animals. Sheep in particular, owing to their heavy fleeces, are subject to insect attacks, and nicotine sheep-washes are widely used to destroy these pests.

The species of tobacco plant most usually cultivated is *nicotiana tabacum*. This will grow in almost any kind of soil, and is at home throughout the Tropics, the only factors which definitely prohibit its successful cultivation being frost and stagnant water. Although a single frost will ruin the crop, the plants mature so rapidly that good tobacco can be grown in England, in Ireland and in Southern Canada, but in none of these countries has the industry attained commercial success.

The character of the soil and the climate have a marked effect on the quality of the tobacco leaf. In some places, although very heavy crops can be grown, the leaf is of no use for smoking purposes and is sold very cheaply for the making of spraying extracts and fumigants. Moreover, the climate affects the product not only during its growth but also during the long process of fermentation and curing which it undergoes after it has been harvested.

The *United States* have the largest production as well as the largest export of tobacco. The tobacco belt lies between the maize and cotton belts, the chief producing States being North Carolina, Kentucky, Tennessee, Virginia, South Carolina and Georgia, although the plant is grown also in many other States. *India* is a close second as a tobacco producer. The crop is widely distributed and is grown mainly for home consumption. Other producers are shown in the Table below.

The most popular pipe tobaccos come from the United States. Native-cured Indian tobacco is not of high quality. *Cuba* has a world-wide reputation for its "Havana" cigars. Where the climate favours the growth of a desirable type of leaf, special treatment is given to the crop in order to obtain cigar wrappers, the best of which come from *Sumatra* and *British North Borneo*. An important feature of the tobacco trade in recent years is the increase in production and consumption of Empire tobaccos, largely aided by a system of preference, *e.g.*, South African tobaccos.

Production of Tobacco

AVERAGE PER YEAR IN THOUSANDS OF METRIC TONS

	1909–1913		'25–29	1932
U.S.A.	452	U.S.A.	613	633 (1933)
India	305	India	541	630
U.S.S.R.	105	U.S.S.R.	165	130
N.E.I.	64	Brazil	87	85
Hungary	46	N.E.I.	86	76
Japan	43	Japan	65	63
Philippines	29	Greece	63	29
Germany	26	Philippines	46	45
Greece	25	Turkey	43	20
Cuba	25	Italy	40	46
France	24	Corea	16	49

QUESTIONS ON CHAPTERS 12 AND 13

1. What are the geographical conditions necessary for the large-scale production of rubber ? Enumerate the principal countries exporting and importing raw rubber. (*I. of B., Pt. I*, 1930)
2. Describe the timber resources of the British Empire, including the British Isles. (*L.C. of C., Junr.* 1931)
3. In what areas of Europe and under what geographical conditions do softwood forests grow ? Show, preferably by a sketch-map, the main directions of export trade. (*I. of B., Pt. I*, 1931)
4. From what parts of the world are obtained the chief supplies of :— Coffee, oil (for soap-making), furs, rice, guano, diamonds ; and where are they chiefly consumed or prepared for use ? (*S.A.A. Prelim., May*, 1930)
5. From what countries does Great Britain get her chief supplies of timber ? What are the main factors determining that supply ? ([illegible] *of B., Qual.*, 1926)
6. What are the world's principal sources of (*a*) natural nitrate, (*b*) copra, (*c*) tungsten, (*d*) gold, (*e*) mahogany, (*f*) mercury ? (*I.C.W.A. Prelim., Dec.*, 1931)

are the principal localities that are sources of petroleum, nickel,
'per, coffee, platinum ? (*I.C.W.A. Prelim., June*, 1931)

8. From what parts of the Empire can the merchants of London obtain Imperial supplies in place of Brazilian diamonds, Para rubber, Swedish wood pulp, Swiss cheese, and Virginian tobacco? (*L.C. of C., Junr.*, 1929)

9. Where are the world's temperate forests? Which of them are in the British Empire? In what respects is Britain dependent upon the products of these regions? (*L.C. of C., Junr.*, 1931)

10. Among the ships lying in the docks at London discharging their cargoes on a certain day, there was one from Sweden, one from Spain, one from Denmark, and one from the Argentine. Say what the probable cargo of each would be and explain what advantages the different countries have for producing the articles you mention. (*C.S., Oct.*, 1929)

11. What are the chief articles used in building houses which have to be imported from abroad? Select any *two* of them and explain carefully why they can be more easily obtained from abroad than at home. (*C.S., Nov.*, 1927)

12. In some parts of the British Isles houses are generally built of stone and in others of brick; slates are the commonest roofing material. Explain how each of the three is obtained, naming some areas of large-scale production. Discuss the sources of the wood which is also required. (*C.S., Jan*, 1930)

13. State shortly the essential features of the world distribution of two of the following and give a more detailed account of *one* area of large production in the case of each of the two selected:—gold, tin, mineral oil. (*C.S., April*, 1930)

14. What kind of material would you expect to be most frequently used for building houses in the suburbs of London, in the dales of Derbyshire, and in British Columbia? Explain clearly why the particular material is used in each case, and point out its advantages and disadvantages for building purposes. (*C.S., August*, 1931)

15. Select any *two* of the following occupations:—fruit farming in California, wheat farming in Manitoba, rubber growing in the Malay States, tea growing in Ceylon. Write what you know about the industries selected, pointing out in each case the influence of climate. (*C.S., April*, 1928)

16. Compare and contrast the coal resources and coal trade of Britain and Germany, with special reference to present conditions. (*I. of B., Pt. I*, 1930)

17. Describe the coal resources of the British Empire excluding the British Isles. (*L.C. of C., Junr.*, 1931)

18. What geographical conditions make water power possible in Europe? Name four areas in Europe where water power is developed, and state in each case the purpose for which the power produced is developed. (*L.M., Sept.*, 1933)

CHAPTER 14

THE LOCALISATION OF MANUFACTURING INDUSTRIES

THE factors which determine the establishment of industries in certain localities are almost endless in variety, but the most important are the nature and position of sources of power; the accessibility to raw materials; the availability of labour; the cost of land and of capital; and the facilities for marketing the finished goods.

Power

Power has in the past undoubtedly been the most important localising factor, and it still exercises the greatest "pull" of all factors. Coal is the greatest source of power, although other power sources have exerted very definite localising influences on the distribution of industry.

The influence of coal in attracting industries to the coalfields varies considerably. The great coalfields of Britain, Belgium, northern France and Germany have all become densely populated industrial regions, but in the United States of America the greatest industrial cities are to be found at some distance from the coalfields. This is true also of many manufacturing towns in both Germany and France. Even in the United States, however, the heavy iron industries, the smelting of ore and the manufacture of mild steel are localised on the coalfields. Where manufacturing towns are not situated on the coalfields the usual reason is either that they were established before the days of the coal era, when their situation was determined by other factors, or, if they have been established since, that factors other than coal supply have exerted a greater influence in determining the choice of location.

Water-power, as we have seen, is tending to rival coal, and its value in the generation of electricity gives it a decided localising influence, in the wider sense; *i.e.*, it is of greater importance in attracting industries to those countries which are well supplied with water rather than in determining the actual localisation of industry within a country. The reason for this is that electricity can be conveyed very cheaply over long distances, so that industries which use it as the basis of their power can be set up at considerable distances from the water supply and in neighbourhoods where they have the benefit of other factors, such as importing facilities or cheap local labour. Actually, therefore, electricity has a *decentralising* influence within a country but a localising influence internationally.

In Italy, Scandinavia, Switzerland and Eastern Canada, water-power is the basis of industry and consequently the determining factor in its localisation, especially of such industries as wood-pulp and paper-making, the extraction of aluminium from its ores, and other electro-chemical and metallurgical industries. (*See* page 186). In Italy water-power has almost eliminated the use of fuel in the cotton industry, while other industries such as woollens at Novara, cheese at Lecco, aluminium and steel at Aquila and Terni respectively, are likewise utilising water-power instead of fuel.

In Norway and Sweden important hydro-electric undertakings support the manufacture of wood-pulp, paper and artificial manures, as well as flour-milling, dairying industries, and the manufacture of textiles and hardware. Certain types of steel, however, still require the use of charcoal, and at Dannemora and Eskilstuna there are important steel smelting works which depend on local iron ore and on charcoal obtained from the surrounding forests.

In Switzerland the abundance of water-power has not only led to the development of an exceptionally efficient transport system—of great importance to Switzerland's tourist trade—but has also made possible the success of industries producing fine textiles and embroideries, watches, clocks, jewellery and fine machinery.

In Western America, south of Vancouver, industry depends on petroleum as a source of power, as there are much larger deposits of that mineral than of coal. In the more northerly part of this coastal strip, however, the proximity of British Columbian coal has caused industry to rely on coal or oil according to which is the cheaper to use. In Texas, Burma and Iraq, also, local oil supplies exist, and here again successful industries have been established which owe their development entirely to the use of the local oil as a source of power.

Raw Materials

Nearness to or accessibility of raw materials has always exerted a powerful localising influence on industries. Textile industries have almost invariably grown up near the source of their raw materials. The woollen industries of the Pennines in both Yorkshire and Lancashire owed their localisation to the near supplies of wool from the sheep on the limestone hills, and the same is true of similar industries in the Tweed valley and the West Country area of England, as well as of the Belgian, German and French woollen industries. In most of these cases, the discovery of coal on or near to the original seats of production caused a further concentration of such industries on or near the coalfields.

The change from wool to cotton manufacture in Lancashire was due mainly to factors other than the nearness of raw materials, although excellent shipping and harbour facilities have made possible cheap imports from overseas. In the south-east of the United States cotton manufactures owe their existence to the abundance of local raw materials, a factor which has also been responsible for the cotton manufacturing industries of India, China and Brazil. Linen manufacture in Northern Ireland, in France and in Belgium arose as a result of the local growth of flax. The great silk industries of Italy, China and Japan are based upon silk-worm rearing in those districts. Leather manufactures at Cawnpore (India), Pirmasens (Germany) and St. Louis (U.S.A.) are the result of local supplies of hides. Plentiful supplies of wheat from the great wheat belt of the United States led to the rise and development of the great flour-milling industries of Minneapolis and St. Paul, though here the presence of water-power was also an important factor.

The Swedish iron industry owes its growth to local supplies of high-grade iron ore and of suitable charcoal. The Wealden iron industry was early localised in the Weald of Kent and Sussex because local beds of iron ore together with forests provided the necessary materials for the industry, but this industry moved to the coalfields when it was found possible and more economical to use coke instead of charcoal in the smelting of iron ore. Fruit-canning in California and in the Straits Settlements is a natural consequence of the suitability of those regions for the growth of fruit.

The development of special industries at ports is also worthy of notice, since the majority of them owe their rise and growth to the facilities for the import of the essential raw materials. Chocolate, sugar and tobacco industries at Bristol, soap at Marseilles, jute at Dundee, leather at London, are outstanding examples of important industries established at ports whose chief attraction for such industries lay in their facilities for importing the raw material and exporting the manufactured article.

Markets

Marketing facilities, too, are of profound importance. The principal factors in this connection are: the density of population in the area where the industry is carried on; the kind of people for whom the goods are to be provided; the purchasing power of the people; the transport facilities available, and the distance of the market from the actual point of production.

There is a distinct difference between industries which develop because the market is near, and those which are established with a view to catering for remote markets. This is particularly noticeable connection with the production and manufacture of food-stuffs.

The introduction of refrigeration and improvements in methods of cold-storage have enabled food industries to be developed on a large scale at distances of thousands of miles from their actual and potential markets. Refrigeration has made it possible to transport meat, for instance, over great distances, and the fact that Argentina is within the chilled beef range of western Europe has caused a remarkable development of meat industries in that country. Similar industries producing frozen beef, mutton and lamb for European markets have developed in Australia and New Zealand, whilst temperate countries of the Southern Hemisphere (such as the Union of South Africa, Southern Australia and Tasmania) have been enabled to develop fruit industries for the supply of northern countries during the season when fresh fruit is not otherwise available there.

Non-perishable goods, raw materials and manufactured goods can, of course, be transported over any distance, and in these cases the important factors are the expense of transport which the produce will bear and the type of people who are to purchase the goods. Cheap goods are manufactured for peoples of small purchasing power, whilst more valuable commodities are made for those regions where individual wealth is greater. Valuable articles (*e.g.*, diamonds and gold) can be sent great distances at considerable expense, whereas articles of large bulk and small value must find a reasonably near outlet (*e.g.*, bricks and potatoes).

In any industrial area where one or two large industries are outstanding there will always arise a number of essentially local industries, directed primarily to supplying the local needs of the people. Thus in most large towns are found brewing, jam-making, clothing and other industries, which developed originally to supply a local market but have since grown to such an extent that their products enjoy a national or even wider demand.

Accessibility of markets is influenced by the development of means of transport. Navigable rivers, railways and canals are all conducive to the rapid development of any area, and in the past vast markets have been opened up as a result of improvements in transport. The Prairies of Canada, for example, advanced rapidly owing to the construction of the Canadian Pacific Railway, which not only made possible the remarkable agricultural development of that region but also made the area a highly important market for the industrial community of eastern Canada and the United States. China, too, is being quickly developed as a market for the products of the industries of other countries, and is at the same time markedly developing her own industries. Power and raw material are both abundant in China, and, as the dense population of the country constitutes an enormous local market, almost every factor is present for the growth of industries on a large scale.

Labour Supply

Labour supply, again, is of vital importance in the localisation of industry. Some industries require an abundant supply of very cheap labour, otherwise the product cannot be marketed at a competitive price; others require highly skilled labour of a particular type which tends to become localised in certain areas because several generations of people have been brought up in intimate association with a trade. Some industries can afford to pay high rates for labour of the requisite degree of skill, whereas others again depend for their existence on the availability of labour which is plentiful, cheap and skilled.

The cotton industry of Lancashire and the engineering industries of the north-east of England, for example, owe much of their development to the presence locally of a supply of labour which, as a result of years of close contact with the industries concerned had developed such a degree of skill as to be long unrivalled. On the other hand, the industries associated with the primary products of tropical lands and monsoon countries require abundant cheap labour, although in some cases, as, for example, tea, silk and rubber plantations, the labour must be highly skilled as well as plentiful and cheap. Hence, these industries, especially those of tea and silk, have become very sharply localised in regions where there is not only a dense population providing cheap labour, but also a population which, as the result of generations of care, patience and dexterity in the treatment of the commodities, has become highly skilled in the necessary tasks. So important is this factor that regions which possess every other geographical factor except that of cheap, skilled labour, have been unable to establish plantation industries. In the United States, for instance, despite other advantages, it has been found impossible to produce tea and raw silk at a competitive cost, but the presence of a large and cheap labour supply in the north-east of the United States led to the establishment and growth of the largest silk manufacturing industry in the world.

In "new" countries, the supply of labour has proved to be a serious problem. Native labour is usually inefficient and wasteful, whilst white labour frequently cannot be employed because of the unsuitable climate. Such factors caused South Africa and western North America to import cheap "coolie" labour from Asiatic countries, and although this enabled the industries for which the labour was imported to become well-established, the mixture of races has given rise to acute social and political problems which have exerted a profound influence on the development of the countries concerned. Australia, especially, has not overlooked the lessons taught by the experiences of these countries. Though ample supplies of cheap Asiatic labour could be obtained from the swarming territories of China, India and Japan, the insistence of Australians on keeping their country "white" has caused them to prohibit the immigration of coloured workers, and, as a result, the development of large tracts of land and of certain industries (*e.g.*, cotton growing and manufacture) is being retarded by the lack of sufficient labour.

Cost of Land

Another important factor in the localisation of industries is the cost of land. In densely populated and highly-developed countries such as Britain, the high cost of land in the urban areas and the consequent high local charges, such as rates, have been largely instrumental in causing industries to be established in cheaper districts at a distance from fuel and raw material. The Bute Docks of Cardiff were constructed there rather than at Penarth because of the very low cost of the site. The numerous industries in the valleys of the Brent, Lea and other rivers of the London area—where the soils were unsuitable for cultivation and the water supply poor—sprang up mainly because the land was extremely cheap, and, as a result, the great industrial metropolitan Boroughs of Battersea, Wandsworth, Lambeth, Poplar, West Ham, East Ham and Willesden developed on these formerly unattractive sites. Similarly, the cheapness of land at Crewe as compared with Nantwich caused the London and North Western Railway to build their works at the former centre rather than at Nantwich; and to the operation of much the same factor was due the establishment of the Midland works at Derby, the London, Brighton and South Coast works at Brighton and the Great Northern works at Doncaster.

This factor must, of course, exercise only a limited influence as the cost of transporting power and raw material may negative any gain which accrues from the cheaper site. But where power can be obtained cheaply and conveniently (as in the case of electricity), and raw materials are either available locally or will bear the cost of transport from the seat of production to the centre of manufacture, industries tend to leave the highly urbanised areas and seek rural situations where rents are low.

Rates, Bounties and other Local Factors

The desire to evade high rates, taxes and tariffs may be instrumental in leading to the establishment of industries where other factors are not operative. Iron works have been established at Braintree (Essex) owing to low local rates. A heavy tariff imposed by France on imports of Nottingham lace has caused the establishment of an important English lace industry at Calais and Caudry. The Ford motor-works at the town of Dagenham in Kent were established with a view to overcoming the disadvantage of a high tariff imposed by Britain on American cars. The same influences led to the establishment of the textile industries of Poland, a land where there are practically none of the geographical advantages that favour the production of woollen and cotton goods.

Industries have from time to time been established as the result of bounties, subsidies, staple rights or court patronage. Governments by their enactments, can greatly stimulate trade, or encourage or discourage specific industries. So, from the earliest times, the influence of governments and even of powerful private individuals has been an important factor in determining the rise or fall of industrial activity. In the time of William the Conqueror, Norman smiths were brought to Warrington by one of William's handmen, Hugo de Lupus. These smiths laid the foundations of the Lancashire mechanical industries. In the Middle Ages, the state-protected staple towns were the only centres recognised as having the right to carry on certain industries, while tin smelting remained a prerogative of the Crown until near the close of the Stuart period. The English woollen industry, again, is indebted in no small degree to the immigration of weavers who were brought over from Flanders by various English rulers.

Political troubles in continental countries, too, have at various times reacted to Britain's advantage. The silk industry was stimulated in England at the end of the seventeenth century by Huguenots who left France on account of religious oppression. But probably no industry so much reflects the influence of political events, court patronage and fashions as the great silk industry of France. Francis I, in 1515, and later Henry IV, who were in sympathy with the Protestant Huguenot silk weavers, gave their industry direct encouragement and caused it to rise to a position of great importance. Persecution of the Protestants by other French kings caused a decline, but in the nineteenth century the industry once more became pre-eminent owing to the invention of the Jacquard loom for the weaving of figured patterns.

In the present century the influence of Government action in Britain is seen in the establishment of the aircraft factory at Farnborough near Aldershot, in the granting of subsidies for the erection of experimental beet-sugar factories in many places, and in the assistance given to the dyeing industries at the end of the Great War. Subsidies are valuable in placing an industry in a sound economic position, but though they may be justified on political, military or national grounds, it is difficult to justify them from a pure economic point of view. Young industries, in particular, deserve every encouragement, but in the absence of favourable geographical and economic conditions it is doubtful whether a country would not benefit more in the long run by importing from cheaper markets commodities which, in the absence of subsidies, cannot be competitively produced at home.

SPECIAL FACTORS AFFECTING PARTICULAR INDUSTRIES

It is seldom that any one factor among those discussed is alone responsible for establishing or maintaining an industry. With the passage of time all kinds of new conditions arise: the influences which affect an industry become ever more numerous and complex; original factors often lose their significance, while industries may continue to [illegible]sist although the favourable factors which originally led to their rise and growth may have entirely disappeared or become greatly modified. An industry may have developed in a certain locality because ample supplies of an essential raw material were available locally, but with the passage of time those supplies may have become exhausted or may have become quite inadequate or unsuitable for an improved modern process of manufacture. Consequently supplies may have to be obtained elsewhere, even from abroad, but, in spite of this, the industry may continue to prosper for a variety of reasons.

Once an industry has been established in a place it tends to remain (even though the factors which originally attracted it there have disappeared) because of what is known as *geographical inertia*, which means that local factors connected with the industry operate to maintain it in that district and to give the locality certain advantages over other localities for the conduct of the industry. Thus the original locality will have the advantages of having at its disposal (*a*) all the necessary arrangements (*e.g.*, transport facilities and water power) for the conduct of the industry; (*b*) a supply of labour accustomed to the processes and doubtless possessing some degree of hereditary skill; (*c*) subsidiary industries which are essential to the main industry; (*d*) factories, plant and machinery of a special type which can be erected elsewhere only at considerable cost; (*e*) administrative, technical and marketing machinery specially adapted to the needs of the industry, and (*f*) a local reputation for the particular class of goods which may be an important factor in their marketing throughout the world.

These facts may be demonstrated by a consideration of the factors which have influenced the rise and growth of some of the leading industries.

The Cotton Industry

The word "cotton" appears to be of Arabic origin, and the manufacture of cotton was introduced into Europe by the Moors when they dominated Spain. Some time later cotton was introduced into England, but in this country its manufacture was not carried on to any extent until the latter half of the 17th century. Thenceforward until the close of the 18th century cotton was manufactured in a desultory way on hand-worked apparatus in the cottages of the people. Indeed, over the whole of Europe, up to the time of the invention of new machinery, the domestic spinning wheel was in use. The great inventions of Hargreaves, Arkwright and Crompton brought about a revolution in cotton-spinning, whilst the perfection of the first power-loom marked the beginning of a vast and world-wide industry.

LANCASHIRE.—Cotton manufacture was introduced into Britain during the sixteenth century by Flemish refugees, many of whom settled in south Lancashire, where the soft water of the Pennines had already led to the establishment of woollen and linen industries, and where the humid atmosphere was suited to spinning.

These were the factors which caused the *original* localisation of the cotton industry in Lancashire, but *subsequent* development was due to the fact that South Lancashire possessed all the natural advantages which, in turn, became necessary to the continued growth of the industry. So, when machinery was applied to cotton manufacture, the necessary water for power and iron for making the machines were available locally: when steam power was introduced, the coal was at hand; when chemical bleaching came to the fore, the Cheshire salts and the soft water of the Pennines were there to assist its development, while the expansion of the industry was facilitated because the development of the necessary transport services was, in turn, facilitated by the valleys provided by the Pennine rivers and the flatness of the south Lancashire plain. Moreover, as time went on, Lancashire workpeople gradually developed an hereditary skill in spinning and weaving which for many years stood supreme.

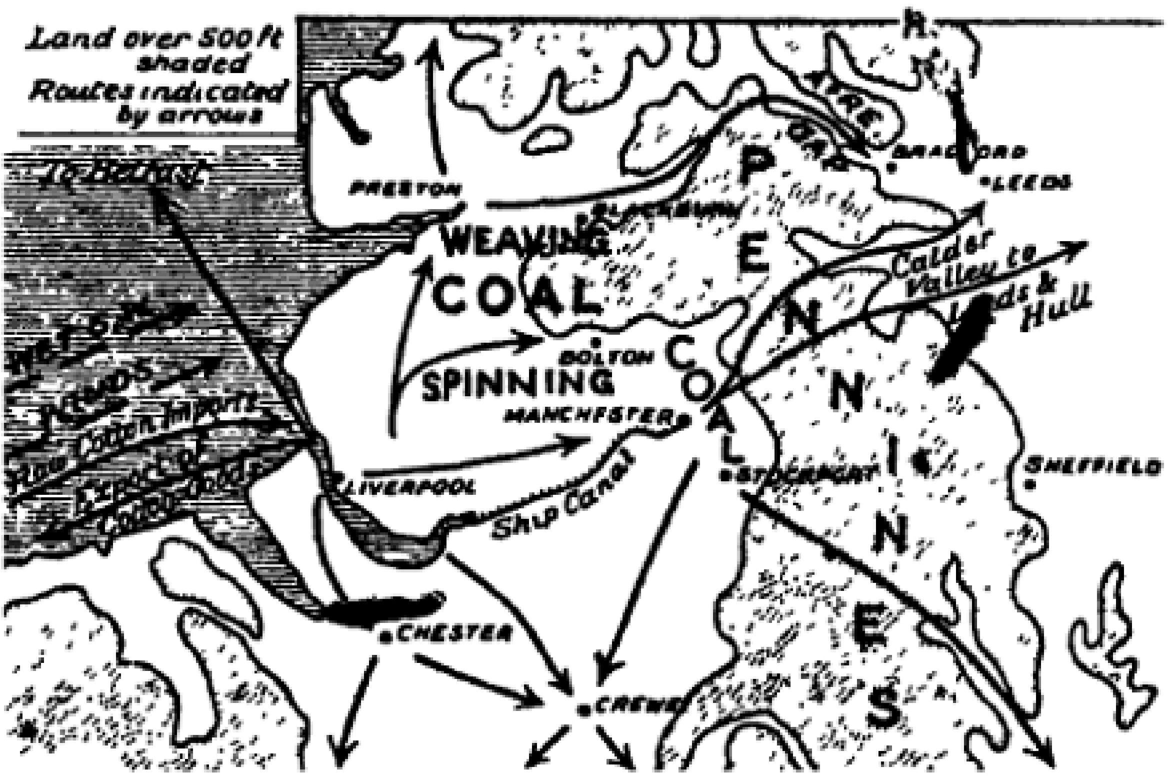


FIG. 116: LANCASHIRE COTTON DISTRICT.

Historical factors have also favoured Lancashire. At the time when cotton machinery was invented wars on the continent of Europe prevented continental countries from taking full advantage of the new inventions, and, later, when the competition of Indian-produced cottons promised to prove harmful, the cotton industry of Lancashire was protected by the prohibition of the import of cotton goods.

Then there were the more general advantages possessed by Britain. No goods have a wider market than cottons, and the bulk of manufactured cotton finds its market in the most distant parts of the world. For such distribution the position of this country is unique, for no other country in the world is so favourably conditioned for engaging in maritime trade. Moreover, as the raw material cannot be produced in Lancashire, (the proximity of that county to the sea, with excellent outlets, has been a great asset.) The geographical conditions of Liverpool, in particular, were such as to give it an advantage over London, Chester or Bristol: its protection from enemy attack, its scouring tides and its proximity to the manufacturing area have all contributed to its development as the world's leading cotton port.

The humid nature of the Lancashire climate has been an extremely important factor in determining the distribution of the cotton industry. It not only cut off the cotton area quite sharply from the woollen district on the leeward side of the Pennines, but even decided the way in which the various cotton towns were to specialise—some in spinning and some in weaving—according to the humidity of their climate. Spinning became centralised in the lower windward towns such as Bolton, and weaving in the drier areas of Preston and Blackburn.

The climatic factor has now lost much of its old importance, for the necessary conditions of humidity can be produced artificially and are being so produced in warm countries, such as India, where the conditions would otherwise be unfavourable.

Scotland.—The cotton industry around Glasgow and Paisley in Scotland owes its growth to similar factors—a damp atmosphere, the presence of coal and the ease of access to the raw material.

The United States.—Cotton manufacture in the United States is most important along the eastern coastal strip from Maine to Alabama. The New England States were formerly the most important, but now they are second in importance to the cotton textile industry centred in and near the raw cotton producing belt of the south.

The New England industry was fostered by the abundance of water-power in the early days and by the comparative ease of obtaining raw material. The water-power is insufficient for present day needs, and New England industries now depend upon sea-borne coal from Nova Scotia and the Appalachians. The leading centres are Fall River, Lowell and New Bedford, all in Massachusetts.

The southern region has local coal and raw material, but the deciding factor in the success of this area as a cotton manufacturing centre was the abundance of cheap labour and the ample supplies of water-power along the "Fall Line" for the generation of cheap electricity. The industry is centred in a number of towns in the States of North and South Carolina and Georgia. The south exports most of its product, which is coarse, whereas the finer cottons of the north are kept in the country. In Philadelphia many British textile workers have settled, and their skill was largely responsible for the success of various types of textile industries, such as the manufacture of lace and tapestries.

Continental Countries.—In France the cotton industry owes its rise to coal supplies from the coalfields of the Franco-Belgian border (Lille, Nancy, Amiens), and to the favourable climate (though this is hardly so suitable as that of Lancashire), while the hereditary skill so typical of the people of both French and Belgian Flanders has had a great influence on its development. There are many cotton centres in Germany, the most important being in Saxony and on the Ruhr coal-field. In Switzerland, abundant water-power, a central position and skilled labour have localised the cotton industry at Berne, Basel and

Zurich. Water-power is used also in the cotton industry at Milan and Turin in Italy. In Spain the centre is Barcelona.

Russian cotton manufacture has three important factors in its favour—the large home market with a growing population, the fact that Russia can produce a large part of the raw cotton required for her use, and the available supply of cheap labour, largely female.

EASTERN COUNTRIES.—Great changes in the world position of cotton manufacture are taking place owing to the gradual industrialisation of the densely populated monsoon countries. Up to recent times these countries have been pre-eminently agricultural, but now India, China and Japan are all manufacturers of cotton. It is significant that Japan, at one time a large grower of raw cotton and now a large manufacturer of both cotton yarn and piece goods, has practically ceased to produce cotton as an agricultural product, and that in recent years she has imported more raw cotton than Britain.

The rise of the Japanese cotton textile industry has been phenomenal and has been due to a number of causes. Probably the leading factor has been the enterprise of Japanese manufacturers. They concentrated on low quality goods (largely imitative of the better quality Lancashire article) to flood the markets of the low wage-earners of the East and in this they had a marked advantage because their available labour (owing to the low standard of living and long hours) was relatively cheap. Moreover, Japan took full advantage of the decreased purchasing power of consumers which resulted from the world depression. The number of middlemen was cut down to a minimum and, if no headway could be made in the markets of one country, no time was wasted in moving to another. The new methods of salesmanship and the appeal of the imitative low-priced goods were reinforced by the exchange advantages of Japan's depreciated currency. In the result, the Lancashire cotton industry finds it impossible to compete successfully with Japan in markets where Lancashire goods were long supreme, and unless Lancashire drastically adapts her methods to the new conditions, she will permanently lose a large proportion of the eastern trade which she formerly monopolised.

China also has important cotton manufactures. Her advantages are abundant raw material, cheap labour, unlimited power resources and an extensive home market for the manufactured article. In India factories have been established in various centres, and that country can now supply part of her own demand as well as provide a little for export.

The general effect of this industrialisation of the East upon the textile industries of the West is that the Eastern outlets for the coarser types of fabrics have become restricted, and that the older and more experienced areas will have increasingly to specialize in finer and more costly materials if they wish to keep alive their textile industries. At present Japanese cottons can be purchased in Lancashire more cheaply than the home manufactured article.

The Woollen Industry

In temperate countries, the woollen industry is the great rival of the cotton industry, and in certain countries it is the more important of the two, although nowhere does it show quite the same concentration in a particular locality as does the cotton industry. Wool is particularly valuable as an article of clothing, for which it has been used for hundreds of years; indeed, for some purposes there is no other material quite so useful. The success of the industry in modern times depends mainly upon the quality of the raw material. The spinning and weaving are not so dependent on climatic influences as in the case of cotton, though the "muggy" air of the Aire and Calder valleys of Yorkshire has proved to be beneficial for some processes. Water-supply is a factor of importance in the washing of the wool and in the dyeing of yarns and fabrics, whilst the invention of power looms and other machinery has made the presence of fuel very important.

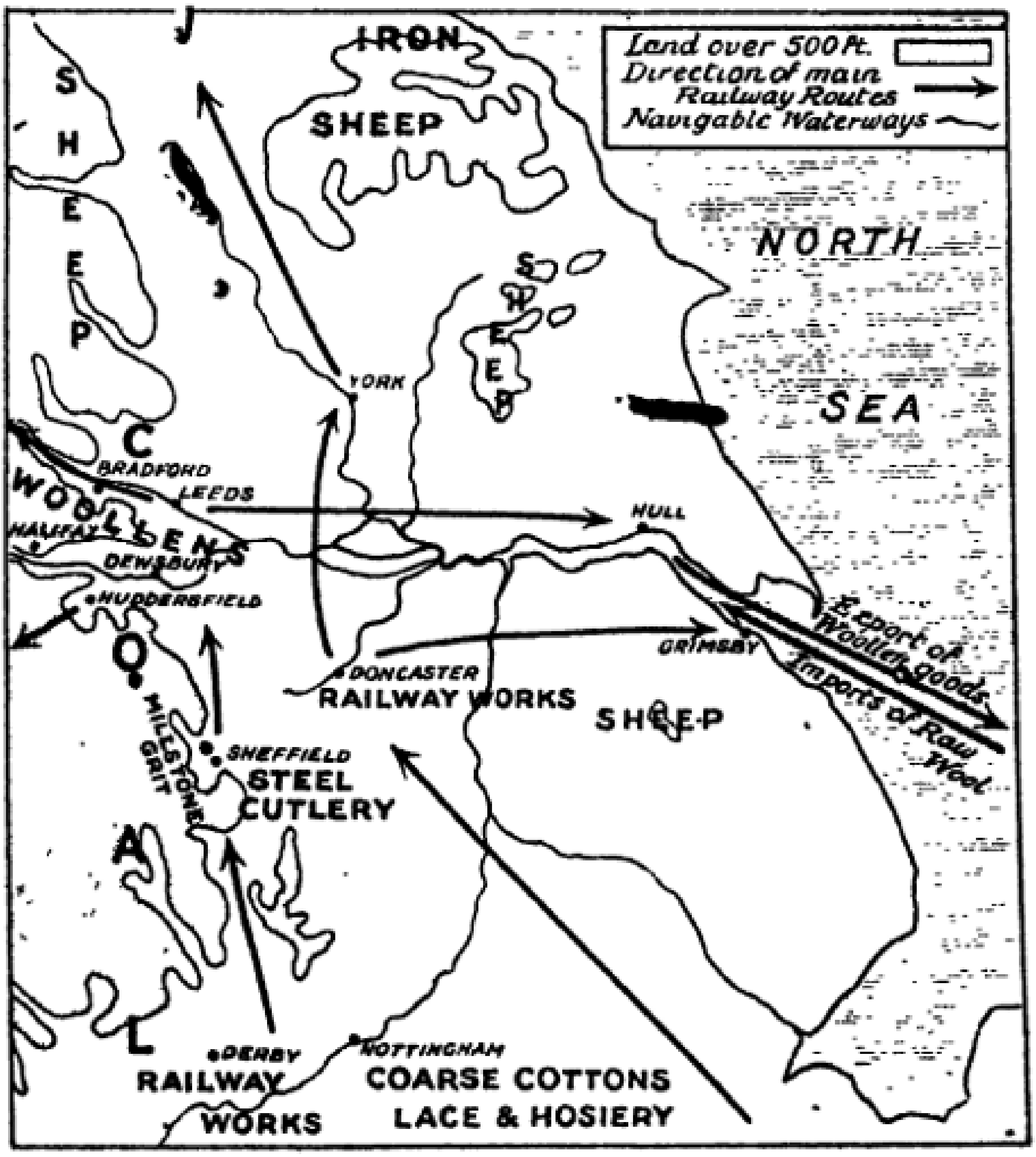


FIG. 117: THE YORKSHIRE WOOLLEN DISTRICT AND THE SURROUNDING AREA.

BRITAIN.—In the Middle Ages, England exported wool to Flanders, but in order to foster woollen manufacture in England, Flemish weavers were introduced by various rulers, notably Edward III, to teach the English workmen.

Norwich was the home of the British woollen industry in its earlier days, but its nearness to the sea and consequent danger from enemy attack caused the industry to settle in Yorkshire, where the *original* causes of localisation were the presence of local raw material from the sheep of the surrounding pastures, and the availability of water supplies for power and for washing and dyeing the wool. *Subsequent* development has been due to the availability of coal for power and iron for machinery, the development of transport and the increasing skill of the workers. (Refer also to Chapter 24.) The great centre of the Yorkshire industry is Bradford, while other towns engaged in the industry are Huddersfield, Halifax, Dewsbury and Batley.

Lancashire, too, was at one time engaged in woollen manufacture, but the phenomenal growth of the cotton industry which followed the change over in that county was not approached in the Yorkshire woollen industry. One reason for this is that the markets for wool are mainly in the industrial areas of the temperate zone, so that the trade is much more restricted than that of cotton, which is in world-wide demand.

There are several other woollen centres in Britain. The West Country industry (Bradford, Trowbridge, Stroud, Frome, Wilton and Witney) arose because of the excellent sheep rearing pastures and the water-power of the Cotswolds. The woollen industry of the Midlands arose because of the supplies of local wool. Leicester and Nottingham, using local coal, make woollen hose, coarse cotton and mixed cotton and woollen fabrics, while Kidderminster is famous for carpets. The Tweed industry owes its rise to excellent pastures, pure water for washing the wool and the local water-power supplies, though power is now obtained through coal from the Midlothian coalfield. Hawick and Galashiels are the chief centres. In Ireland, the Hebrides and the Shetlands, woollens are made by hand looms.

UNITED STATES.—In the United States small woollen factories are to be found in every State in the Union. The large scale factories, however, are concentrated east of the Alleghanies, where there is power to drive the machinery and abundant labour to manufacture the wool. Massachusetts and Pennsylvania are the States mainly concerned, Philadelphia being the great woollen centre. Here the manufacture of woollens shows very clearly its dependence upon dense population for its continuance, the raw material being transported thousands of miles to the densely populated manufacturing centres.

CONTINENTAL COUNTRIES.—The manufacture of woollens is important also in Germany (Rhine and Elbe valleys), north-east France (Seine valley), Austria (Upper Danube valley) and Switzerland. Here the population is dense, there is abundant power (coal or water), and local supplies of wool from the sheep reared on the adjacent pasturage.

EASTERN COUNTRIES.—So far as the Eastern countries are concerned, there is an important difference between the development of woollen manufactures and the development of cotton manufactures. The monsoon countries, as we have seen, grow large supplies of raw cotton and are also rapidly developing cotton manufacture, but they have been unable to produce wool, so that the adoption of western ideas in clothing has caused a demand for woollen textile fabrics in both those countries. This in time should lead to a greater demand for wool, and possibly to higher prices, because of the large amount of land required to produce it.

Japan is becoming an important wool manufacturing country. Encouraged by the success of the cotton and rayon industries, several Japanese cotton concerns have decided to add wool spinning and weaving to their other activities. Over 90 per cent. of the wool imported is obtained from Australia.

Natural Silk

Silk being very light is transportable at low cost, so, from the standpoint of raw material supplies, centres of silk manufacture may be situated in almost any locality regardless of the place of origin of the raw material. Nearness to raw material as a factor in localising silk manufacture is consequently far less important than is the case in most other industries. Political factors, court patronage, changes of fashion and invention, some details of which have already been given, have been prominent factors in the localisation of the industry.

THE UNITED STATES is the greatest silk manufacturing country in the world, although that country does not produce a single bale of the raw material, mainly because of the absence of an adequate supply of cheap and skilled labour. On the other hand, the abundance of labour suited to textile manufacture, especially female labour, has been an important factor in the rise of this great manufacturing industry, and has caused it to be located in close proximity to heavy industries which require large numbers of men, whose wives and daughters can be drawn upon for the labour supply required for the silk mills. The industry has also been fostered by a high protective tariff. The principal centres are the States of New York, New Jersey and Pennsylvania.

IN EUROPE, the factor of nearness to raw material has been the most effective cause of localisation of the silk industry, and Britain, without the advantage of being able to produce any of the raw material as an article of commerce, has never been able to compete with silk manufacturing centres in France, Italy, Switzerland and Germany. Italy has for centuries produced raw silk, and its silk mills and factories at Milan, and in Piedmont and Venetia, though far behind those of the United States, have flourished because of the ready availability of the raw material, and of cheap, skilled labour.

Silk artisans from Milan who emigrated to France in the early part of the sixteenth century were responsible for the rise of the French silk industry, which is centred at Lyons. The German silk industry is centred at Crefeld, and the Swiss industry at Zurich, Berne and Basel.

IN ASIA, silk manufacture is a very old industry but it has been outstripped in importance by that of the western countries. The leading countries are Japan, China and India.

Artificial Silk

The manufacture of artificial silk has increased to a remarkable extent during recent years. In 1913, world production was 16,000 tons, but now it is well over 250,000 tons. The industry is highly technical, requiring both scientific knowledge and complicated machinery. It needs pure water for the chemical processes and cheap power, together with abundant, cheap and comparatively skilled labour. The raw material is mainly wood-pulp which will bear some expense of transport, so that it is not necessary—although it is of course an advantage—for the factories to be situated at the ports of import. Moreover, the final product is one of high value in porportion to its weight, and it can therefore bear the cost of transport over considerable distances.

The principal artificial silk producing countries are the United States (on each side of the Appalachians, principally at Roanoke, Lewistown and Parkersburg); Britain (Coventry, Derby, Wolverhampton, Braintree, Flint, Liverpool and Manchester); Italy (in the Alpine valleys and at Milan); Germany (at Cologne and in the Black Forest region); France (at Compiègne and Valenciennes on the north-east coalfield, and in the Rhône basin); and Japan, where the industry has made such enormous progress since it was established only seven years ago, that Japan is now second to the United States as a producer of rayon.

Artificial silk manufacture has had a distinctly adverse influence on the cotton industry. The finer counts of Lancashire cotton especially are meeting with severe competition from artificial silk, and the tendency now is to introduce materials made from mixtures of artificial silk and cotton or linen. There is a future for this industry, but up to the present the drawback has been that artificial silk will not take cotton dyes, and science is engaged upon the solution of this problem.

Linen

Linen, made from flax fibre, is probably the most ancient of all textile fabrics. The remains of the ancient Swiss lake-dwellings have yielded a material which appears to be linen, whilst the wrappings of ancient Egyptian mummies are certainly of linen. Flax was grown before the eighteenth century on every European farm, and the disappearance of flax spinning and weaving as a home industry was due to the invention of machinery and to the rapid growth of the cotton industry.

Linen is the most durable of all textiles since it is unaffected by wetting, but the cost of procuring the fibre from the stalk of the plant is sufficient to make the use of linen much less general than that of cotton and to confine it to special articles where hard wearing qualities and high finish are essential.

Apart from the preliminary processes through which the plant has to pass before the fibre is available for spinning and weaving, the conditions favouring its manufacture are much the same as for other textiles, but the centres of manufacture are almost confined to the regions where the flax is grown or can be easily procured ready retted.

EUROPE.—North-eastern Ireland, the Dundee district of Scotland, Belgium—with specially suitable water in the Lys at Courtrai—and Westphalia in Germany are the chief linen manufacturing centres in Europe.

IN THE UNITED STATES the linen industry is concentrated at Troy (New York), which produces 90 per cent. of the total linen output of that country.

Leather

Leather is manufactured by subjecting hides to a process whereby the action of a solution in which the hide is steeped changes the chemical character of one of the constitutents of the hide, rendering the latter hard and durable with little loss of flexibility. This solution is invariably of vegetable origin and the active principle is known as *tannin*, from which the process technically called *tanning* derives its name. Tannin is obtained from the bark of certain trees; in Great Britain oak-bark has long been the principal tanning agent, but many other substances can be used, some of them to give different varieties of leather. The only notable mineral substance used is derived from the metal chromium, and chrome leather is now well established.

THE UNITED STATES leads the world in the manufacture of leather, mainly because of vast supplies of hides from her prairies, the abundance of tanning bark in her forests, and the extensive demand in that country for the manufactured article. The manufacture of leather articles, such as shoes, is concentrated in densely populated centres where there is not only abundant labour but also a local market. Mass production and the multiplicity of sizes and fittings have enabled the industry to grow to an enormous extent, and nowadays the hand-made shoe can be procured only at a relatively high price. Chrome leather was first developed in Philadelphia, which is the greatest leather-manufacturing centre in the world. The glove industry of the United States is centred at Gloversville and Johnstown (New York), where it was started by Scottish immigrants, and has since remained as a result of geographical inertia.

IN EUROPE, Germany stands first in leather production, a consequence of its position in the centre of a densely populated area, whence it can collect all the necessary raw materials and can turn out its products abundantly and cheaply. France, with Paris as the centre, specialises in gloves, the skins being provided by the mountain goats of the south-eastern area. Vast boot and shoe factories exist also in Czechoslovakia.

Great Britain has always had a reputation for harness and saddlery, though its exports of boots and shoes are greater. As elsewhere, the location of the leather centres of this country has been influenced chiefly by the presence of tan bark, or the facility for obtaining it, and of suitable water, though most cattle rearing areas have tanneries which depend on the available supplies of hides. London (Bermondsey) became a leather centre owing to its facilities for importing hides and tan-bark; Leeds established tanneries owing to local oak bark and suitable water; Leicester, Northampton, Stafford and Walsall are all on the edges of cattle rearing or hunting areas. The further specialisation of towns such as Leicester and Northampton in boots and shoes is to be attributed to the development of modern boot-making machinery and to the opportunity and markets which such industries were afforded because the people on the coalfields were occupied in their heavy metal and textile industries.

Earthenware and Pottery

These are manufactured from clay of various kinds: for the coarser types of pottery (*e.g.*, earthenware, such as panmugs and plant pots) any kind of clay will suffice, provided it be free from iron. It is seldom that a pottery manufacturing district has all the materials required for the industry, and the location of the works depends on the presence of adequate supplies of the more bulky materials combined with the facility for obtaining the others.

IN ENGLAND, the centre of pottery manufacture is located at Stoke-on-Trent in North Staffordshire ("the Five Towns"), where one of the five, Burslem, has long been the chief seat of manufacture. In this area the industry has reached its present dimensions as the result of a variety of causes, but the two outstanding factors are the occurrence together of two important heavy materials, coal and coarse clay, and the central situation—almost equidistant from the important ports of Liverpool, Hull, London and Bristol—with excellent transport facilities for distributing the product to populous home centres and to overseas markets. Indeed no other pottery manufacturing area in the world is so ideally situated both from the standpoint of supplies of the necessary raw materials and from that of suitable outlets for the product. The clay is used not only to make certain rougher utensils, but also for making the *seggars* or cases in which porcelain and better class earthenware are baked in furnaces fired with coal.

These factors have caused pottery manufacture to reach greater dimensions in England than in any other country, while the industry received a marked impetus from the inventions of Wedgwood, which improved porcelain manufacture to such an extent that the best English porcelain cannot be rivalled anywhere.

For the finer varieties of china, kaolin (decomposed felspar) or china clay is necessary. In England, this is supplied exclusively by Cornwall and Devon, whence it is transported by sea and canal to the "Potteries" of Staffordshire and of other countries, some even being shipped across the Atlantic to supply the factories of the United States.

EUROPE.—The development of the porcelain industry through the centuries has caused the names of the towns making the more famous kinds to be attached to the product, and important factories giving their names to special types are still working at places such as Worcester

(England), Meissen near Dresden, Sèvres near Paris, Delft in Holland and Majolica in Italy.

CHINA AND JAPAN have long been famous for their porcelain. Both have large deposits of kaolin—which name is actually derived from a mountain of that name near Hankow in China, composed almost entirely of the material.

In the UNITED STATES the industry has been helped by protective duties until it has reached considerable proportions, despite the fact that the chief centres of manufacture are situated at some distance from the source of most of the necessary raw material. Trenton (New Jersey), the chief pottery centre of the United States, draws its coal from Pennsylvania, quartz or felspar from the Adirondacks, clay from Florida and the best kaolin from England. Transport facilities by sea and land, together with abundant supplies of labour, have enabled the industry to flourish.

Glass

Glass is somewhat similar to pottery in the abundance of its uses, but it is rather more difficult to pack securely and to transport. Further, it is more restricted as regards suitable areas of manufacture, more especially as the industry must be situated near a good supply of fuel. High temperatures are required for fusing the mixture of ingredients, and the processes of manufacture require [illegible] considerable degree of technical skill.

Potash, soda, lime and red lead are all ingredients of various kinds of glass, and the location of the industry is largely determined by the presence or absence of these ingredients in close proximity to fuel supply. Those coalfields which have salt deposits in their vicinity are thus suitable for glass industries, while areas of highly developed chemical industries are usually favourable to glass manufacture. For large-scale glass manufacture considerable machinery is required, and this factor again tends to locate the industry near a coalfield. Scientific research and invention have also been important factors, and have been widely applied especially in Germany, Czechoslovakia (Bohemia) and England, which all excel in the production of the highest grades of glass.

THE UNITED STATES leads the world in the manufacture of glass of the cheaper machine-made variety, but that country imports the finest grades from Europe, especially Jena glass for lenses and optical work generally, English crystal glass and Bohemian glass. The most important centres in the United States are in Pennsylvania (particularly Pittsburg), New Jersey (Millville) and Indiana (Muncie and Gas City). The presence of natural gas, which afforded a cheap source of the necessary heat, was an important factor in the rise of the industry in these areas, but, with the exhaustion of the gas supplies, coal is becoming the principal factor in determining the localisation of the glass industry.

Germany follows the United States in importance as a glass-producing country, the principal centres being on the coalfields of the Ruhr, Saxony and Silesia. The making of Jena glass, one of the finest grades which is used for scientific instruments, was formerly a German monopoly, but optical glass of equal quality is now being made in England. Germany also makes bottle glass, window glass, watch glass and decorative glass.

Britain.—The British glass industry is situated on or near the coalfields, notably at St. Helens (Lancashire), Birmingham, South Shields, Stourbridge and Dudley (Worcestershire) and Glasgow. Glass bottles are made in Yorkshire (Castleford, Doncaster and Rotherham). English "Flint" glass or "crystal" is made with potash and red lead, and is more fusible, more lustrous and softer than other kinds. It is specially capable of being finely cut and engraved when cold. Stourbridge is the leading centre.

Czechoslovakia has a highly important glass industry, which is located around the Bohemian Forest, where coal, potash and silica are in close proximity. The principal centres are Eger, Gablonz and Haida. Prague makes beautiful coloured glass, and also unbreakable glass, the latter from sand obtained near Dresden in Saxony (Germany). All kinds of glassware are made in Czechoslovakia, but especially glass of the cheaper variety, and about 80 % of the output is exported.

Belgium has the most important plate-glass and mirror-glass industry in Europe. Here again the industry is centred on the coalfield and in close proximity to the other necessary raw materials, Charleroi being the most important centre. For plate glass the finest materials only are used and the fused material is rolled out into sheets by steel rollers.

In France the glass industry is centred in Baccarat on the northern coalfield, where crystal glass is chiefly made.

Other glass-making countries are Poland, Austria, Italy (coloured glass at Venice) and Japan.

Heavy Metal Industries

Iron Smelting Industries were originally located wherever blacksmiths and iron workers needed the iron, but more especially in places where deposits of ore were to be found in proximity to abundant timber for fuel. From the earliest times iron ore was smelted in Kent and Sussex by using the forest timber from the Weald. In the United States, before the mechanical discoveries lead to the great concentration of the industry, ore was smelted in many scattered localities, whilst similar conditions prevailed in Europe generally.

The opening of the coalfields caused the disappearance of the small and isolated workings, and led to the concentration of large iron works on the coalfields in proximity to abundant fuel. The occurrence of large ore supplies on many coalfields encouraged this concentration, and for some years past the most important iron smelting operations have been carried on in the coal areas. Nevertheless, certain finer qualities of iron can be produced only by the use of charcoal for smelting the ore, and the purest iron is made where there is abundant timber, as in Sweden and parts of Russia.

While the presence of ore and fuel in close proximity has been the main factor in localising iron industries, new inventions and the discovery of more efficient processes in manufacture have accentuated the concentration on coalfields. Before the discovery of a method of smelting ores containing phosphorus, the English iron and steel industry was pre-eminent, since non-phosphoric ores were present in north-west England, whilst ores of equal quality from Spain, Greece, Sweden and Algeria could be transported by sea and unloaded at the blast furnaces of such places as Newport and Middlesbrough. As opposed to this, the ores used on the Continent, and especially those imported from abroad, had to bear the cost of transhipment and railway journeys. This transport factor proved so important in America that iron industries have tended to be located on the shores of the Great Lakes, and blast furnaces have been built alongside the docks where the ore steamers unload.

The so-called " heavy " methods of production of iron and steel are responsible for a certain immobility in the centres of industry. The plant required is extensive and costly, while both raw materials and the product are bulky and heavy. Hence large-scale production has been inevitable, while ready access to markets for the finished goods is essential, with the result that the industry has concentrated in the United States, Great Britain, Belgium, Luxemburg, France and Germany, in all of which there is easily available ore and coal, or access to sea, rivers and canals. In quite recent years, however, the use of electricity for smelting iron ore has been rapidly developing. Consequently, the question of proximity to fuel will tend to be of less importance, and it is to be anticipated that iron and steel industries will grow rapidly in countries such as Norway and Sweden, which have iron ore and abundant water-power but no coal.

The development of smelting industries along the Jurassic Belt in England, and in the large iron-ore district of Lorraine, followed the discovery of the so-called *basic process* of steel manufacture, by which lower grade ores containing phosphorus can be used for iron production. Further, the exhaustion of ore supplies on the coalfields made it possible for these low-grade jurassic ores to compete with imported ores and so to find a market within reasonable distance of the fuel.

The fine steel made in Sheffield for cutlery followed the discovery by a Sheffield manufacturer of the *crucible* process of converting iron into high grade steel suitable for the best cutlery. For other processes, less costly steel is used and has long been obtained by the *Bessemer* process. The *open-hearth* process is more recent and has provided the bulk of the more reliable steel for shipbuilding. The electric process seems destined to supersede all these processes, and thus the future importance of hydro-electric power in the steel industry is beyond calculation. Indeed, in Scandinavia, electric smelting has reached such a stage that ores with a very small iron content can be profitably utilized.

The following Table shows the world production of pig iron and steel in the leading countries for the years 1913 and 1929.

Production of Pig Iron and Steel

Millions of Tons

	Pig Iron		*Steel*	
	1913	1929	1913	1929
U.S.A. ...	30·7	43·0	31·3	55·0
Germany ...	19·0	13·4	18·6	16·2
France... ...	5·1	10·4	4·6	9·7
Great Britain...	10·3	7·7	7·7	9·8
Russia ...	4·6	4·3	4·1	4·9
Belgium ...	2·4	4·1	2·4	4·1
Luxemburg ...		2·9	[illegible]	2·7
The Saar ...	--	2·1	[illegible]	2·2
Japan	·2	1·5	--	2·2
India	·2	1·4	--	·6

It has been said, with much truth, that the iron and steel industry is a "barometer of industry and trade." In consequence of the world depression, the output of pig iron and steel has declined enormously since 1929, being exceptionally low in 1932, when the United States, for example, produced only 8·6 million tons of pig iron and 13·2 tons of steel, or an output of only 22 per cent. of the 1929 figures. A noteworthy exception is the U.S.S.R., where in 1933 the output of pig iron increased to 7 million tons and of steel to 6·5 million tons. The world figures of production for 1933 showed an upward trend but were still far below the 1929 figures.

Shipbuilding is a special branch of the iron and steel industry. For its establishment and successful operation, it requires deep water and adequate shelter, large stretches of land along the shore for building, efficient wharves and docks, and proximity to iron and steel manufacturing districts.

Great Britain is pre-eminent in shipbuilding because of her abundance of coal and iron, her many excellent estuaries, and the small insular characteristics of the country, which led to the growth of a sea-faring population and to the establishment of a world-wide empire. Many of her estuaries penetrate coal-fields, and it is along the shores of these estuaries that the shipbuilding industry has flourished, as on the Clyde, the Tyne, the Wear, the Tees and Belfast Lough. British shipbuilding also benefits from other factors, especially the availability of abundant capital and the economy of production which has resulted from the enormous size of the industry. Whereas other countries can lay down only one or two ships at a time, British shipyards are in a position to have a dozen under construction at once, all of the same type, so that parts can be duplicated in manufacture. This lowers costs of production to an extraordinary degree, and the relatively low prices create further demand.

No other country has such excellent shipbuilding facilities as Britain, though the United States, Germany, Japan and Sweden are by no means unfavourably placed. In North America a special localisation of shipbuilding occurs on the shores of the Great Lakes, since large vessels from outside cannot reach the Lakes.

Iron and Steel Industries of the Leading Countries

The United States of America is the greatest of all iron manufacturing countries. Pittsburg, with local ores, coal and coke and at the junction of navigable waterways, soon became the leading centre of the American iron and steel industry and is now the most important iron and steel centre in the world. Local supplies of ore are nowadays insufficient and much is received *via* the Lakes from the Lake Superior iron region. Other steel centres are the Lake ports, where the fuel is carried to the ore by the ships that carried ore westward to Pittsburg, and around Birmingham in Alabama in a district where iron, coal and limestone, the three essentials, are found in close proximity.

The manufacture of agricultural machinery is located near the markets and has thus gradually moved westward. Chicago is the great centre, followed by Moline (Illinois), Springfield (Ohio), South Bend (Indiana) and Racine and Milwaukee (Wisconsin). The motor-car industry is located in the centres of the old horse carriage industry. Detroit and Cleveland are easily first, followed by New York, Buffalo and Indianapolis. Textile machinery is naturally made near the centres of the textile industry, *e.g.*, at Worcester (Mass.), near the centre of the New England textile industry. Machine tools are made at Cincinnati and Cleveland (Ohio), Philadelphia and Worcester. The making of engines and electrical machinery for manufacture is centred at Milwaukee, Pittsburg, Philadelphia, New York and Schenectady (New York). Railway wagons are made at Pittsburg, St. Louis and Philadelphia—the latter town being the leading locomotive manufacturing city in the world.

Shipbuilding is important at Philadelphia, Camden, Chester, Wilmington, New York, Bath (Maine), Quincy (Mass.), Baltimore, and Newport News on the Atlantic coast; at Cleveland, Chicago, Detroit and Buffalo on the Lakes; and at San Francisco, Los Angeles and Seattle (warships) on the Pacific coast.

In Great Britain, the iron industry became centred in those districts where coal and iron were found in close proximity. As these areas were close to the sea, a large export trade developed and, when later the iron deposits proved insufficient, facilities for import were readily available.

The leading centres are at Tyneside on the north-east coast; in the West Riding of Yorkshire; South Wales; the Central Lowlands of Scotland; the "Black Country" (Birmingham district), and north Lancashire (Barrow). Agricultural machinery is most important in the agricultural east and south-east, at such places as Lincoln, Norwich, Bedford and Peterborough. Motor-cars are made at Coventry, Birmingham, Oxford, Derby and London, and cutlery at Sheffield. The finest textile machinery in the world is made in the textile centres such as Manchester, Bolton, Rochdale, Accrington and Oldham in Lancashire, and Leeds, Bradford and other centres in the woollen manufacturing area.

The Birmingham district specialises in light goods such as bicycles, hardware, chains, nails and screws which can bear the cost of transport, and in goods such as motor-cars which can more or less take themselves to market. Rolling stock is made at Gateshead and Stockton, and locomotives at Derby, Darlington, Swindon and Crewe—the great railway headquarters.

The famous shipbuilding industry of the British Isles is centred on the Clyde (Greenock, Port Glasgow, Dumbarton, Clydebank), the Tyne (Newcastle, Jarrow, Wallsend and North and South Shields), the Tees (Middlesbrough and the Hartlepools), the Wear (Sunderland), and at Southampton, Hull, Birkenhead, Barrow and Belfast. Warships are built at Chatham, Sheern[illegible]rtsmouth, Devonport, Cork and Rosyth.

The GERMAN iron industry is centred mainly in the Ruhr district, with less important centres in Upper Silesia, Saxony, Bavaria and Hanover. The localisation of the industry is a result of the presence of coal and iron in close proximity; the existence of good transport facilities, and the suitability of the coal for the production of gas and coke. The Ruhr region is particularly well favoured with navigable waterways which facilitate the export of the finished goods as well as the import of iron ore from Sweden, Luxemburg, Lorraine and Spain at low rates. Essen and Dusseldorf are noted for heavy engineering; Solingen, Remscheid and Tuttlingen make cutlery and hardware, whilst Iserlohn is noted for needles; Zwickau and Chemnitz, the leading textile centres, specialise in textile machinery; Dresden and Leipzig concentrate on sewing machines and pianos; Magdeburg and Halle make agricultural machinery and electrical goods. Frankfurt, also, is engaged in the manufacture of agricultural machinery. Shipbuilding is centred in the northern ports such as Kiel, Hamburg, Stettin, Bremen, Rostock and Lubeck.

The German iron and steel industry received a serious setback as a result of the Treaty of Versailles, by which Germany was deprived of important coal and iron producing regions. Nevertheless, Germany is still second in importance to the United States as a producer of iron and steel.

France. The principal centres of the French iron industry are the Lorraine ironfield and the northern coalfield areas. Le Creuzot and St. Etienne, with local coal and iron, were the original centres. Lille, Valenciennes, St. Etienne and Roubaix are engineering centres. Le Creuzot makes steel rails, locomotives and armaments; Lyons makes machinery and automobiles—the latter being made also at Paris and St. Etienne.

Other Metal Industries

These industries are localised in special areas for various reasons.

Copper Smelting is carried on near ore and fuel. Copper ores and tin ores from Cornwall were long smelted around Swansea, but Cornwall now supplies little tin and no copper, so that large quantities of these ores, either raw or partly smelted, are received by South Wales from the Malay States and Spain respectively. The proximity of fuel to ore led to copper smelting near the Great Lakes of North America, but Montana, Arizona, Nevada and Utah are now yielding larger supplies.

Copper, tin and zinc are used together to make the alloys *brass* and *bronze*. Birmingham is a world-renowned centre of the brass-founding industries, its fame being due to the abundance of suitable moulding sand in the local triassic rocks, and to the transport facilities for obtaining the metals from South Wales (but see also Chapter 25).

Tin-Plate industries remain at [illegible]porting ports such as Swansea, which has ample coal supplies [illegible] which obtains, by cheap sea transport, the tin ore and the palm [illegible] that are necessary.

Aluminium industries are essentially hydro-electric. They are localised as a rule away from other industrial areas in regions of abundant water-power, *e.g.*, in Switzerland (Schaffhausen); at Niagara Falls (U.S.A.) and Shawinigan Falls (Canada), in Scotland (Kinlochleven) and above all at L'Argentière in south-eastern France. Germany has large works in the lignite districts, the lignite being capable of producing the necessary high temperatures whilst its cheapness permits the cost of production to be kept sufficiently low.

Chemicals

Large-scale chemical industries arise mainly to meet the demand for sodium carbonate, caustic soda and chlorine for use in the manufacture of glass, soap and bleaching powder. The materials necessary for this are common salt, carbonate of lime (limestone), and sulphuric acid—manufactured from iron pyrites (iron sulphide). The localising factors here are mainly salt and lime, so we find that, where salt deposits occur in close proximity to limestone, chemical industries have arisen. The triassic rocks are usually salt-bearing, and, as these rocks lie adjacent to the coalfields, which in turn are next to limestone outcrops, it is in such regions that chemical industries have developed, as, for example, at Widnes and St. Helens in Lancashire, and at Chicago, Cincinnati and Philadelphia in the United States. Iron pyrites may occur locally or may have to be imported, and although it is a bulky commodity, it will bear the cost of transport better than the other bulky materials which are used, so that the industry tends to settle near the fuel and the salt. A more recent tendency is the development of electrolytic methods, which minimise the use of coal and use power which can be transported easily and cheaply to the areas of production. Chemical industries are consequently becoming centralised in salt areas and coal is no longer a predominating factor. In forest areas chemical industries arise near supplies of pyrites, since the sulphuric acid derived from the pyrites can be used for a multitude of chemical processes, whilst abundance of fuel is at hand.

Chemical industries are often of the greatest complexity and require a large variety of other raw materials, supplies of which are confined to restricted areas of the earth. Potash is a most important raw material of these industries and, as this was formerly obtained by burning vegetable matter, timber-producing countries were the leading sources of supply. The discovery of the enormous deposits of natural potash at Stassfurt in Germany made that country the first source of supply, and, until further deposits were found to exist in Alsace and N.E. Spain, the Stassfurt deposits yielded 90 per cent. of the world output. Indeed, these deposits of potash allied with available supplies of other important raw materials, and Germany's attention to technical education and research [illegible] that country as the foremost chemical manufacturing nation [illegible] the world. The most important chemical producing region is in the Rhine basin, the leading centres being at Leverkusen near Cologne, Elberfeld, Frankfurt and Hoechst, all situated within easy reach of the coking area of the Ruhr. Other centres, such as Stassfurt, are situated in the potash-producing areas or where water power is available, as is the case in Silesia and Upper Bavaria.

The War revolutionized the chemical industry. Valuable raw materials for the manufacture of high explosives were found to be obtainable from coal tar products; and a waste substance produced in the manufacture of coal gas, which had yielded, as a result of Perkin's researches, the remarkable aniline dyes, was used as the source of enormous quantities of benzol, toluol and similar products for use in high explosives. This branch of the chemical industry was so important that it has become a key industry in some countries, notably Britain, the United States and Japan.

The use of water-power in the generation of electricity has influenced chemical industries to a great extent. The electric furnace made possible the manufacture of calcium carbide and the fixation of nitrogen from the atmosphere, which led to an increased production of artificial manures, such as cyanide of calcium, nitrate of ammonia and nitrate of lime. The vast amount of power required by such electro-chemical industries means that they can be most successfully carried on when that power is cheap and plentiful, hence they are ideal for and have rapidly developed in countries such as Norway, Sweden and Switzerland with abundant water-power supplies.

Other important chemical industries, the results of new discoveries and abundant raw material, are the manufacture of chemical wood-pulp in forest areas, and the manufacture of industrial alcohol from potatoes in regions such as North Germany, where vast quantities of potatoes are grown.

Paper and Wood-Pulp

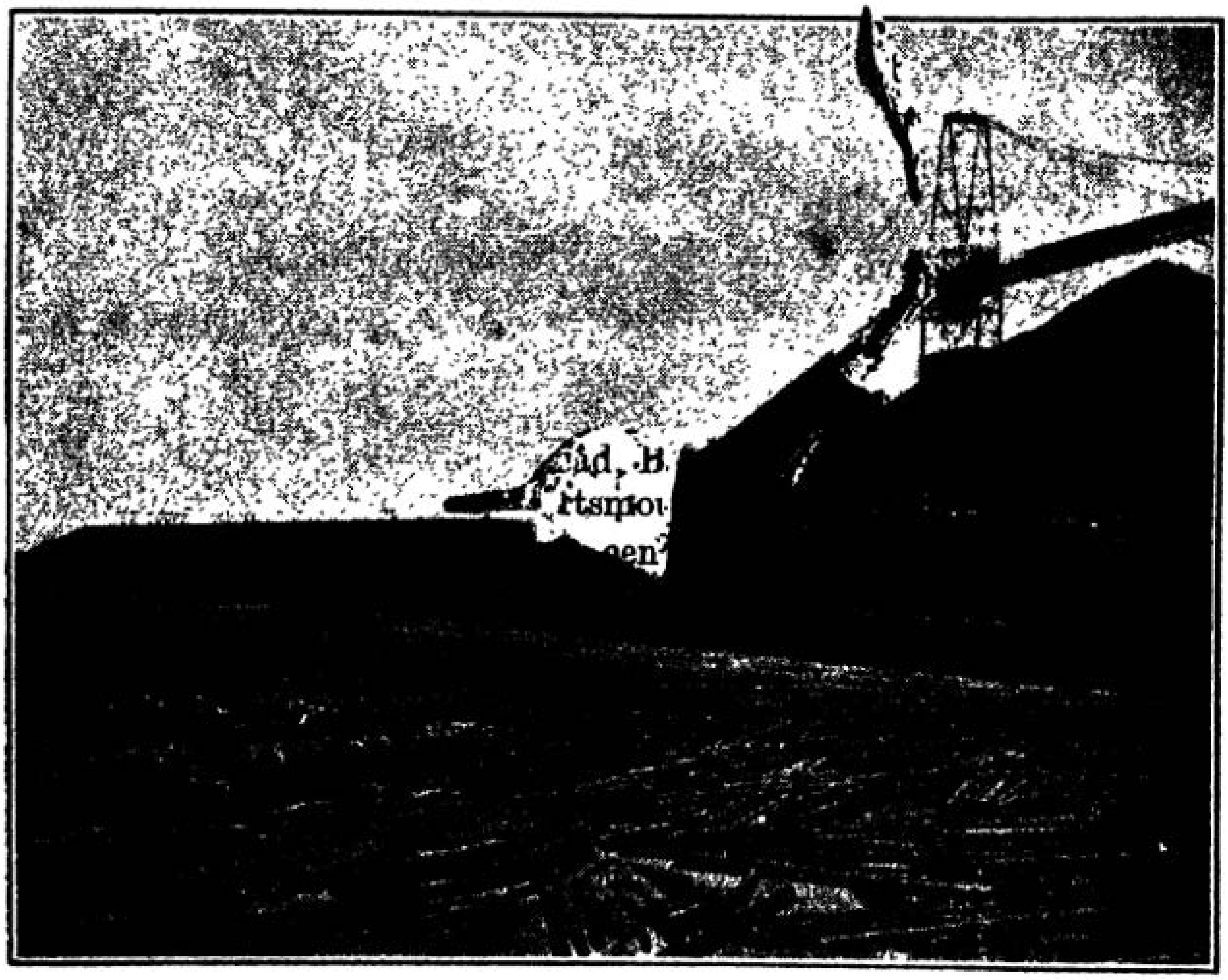
Formerly paper was manufactured almost entirely from rags, linen rags being used for the finest kinds of paper, and cotton or woollen rags for the cheaper qualities. With the rapid development of printing, the supply of rags soon became quite inadequate to meet the demand for paper so, in 18[illegible]7, esparto grass or "alfalfa" was first used for the purpose, and is still used in large quantities for making high quality paper. Later, wood-pulp was applied in paper manufacture, and it is now used in enormous quantities for the production of most cheap varieties.

The earlier paper factories depended much less on fuel than on other requirements, so that their location was determined chiefly by the presence of pure water, clean surroundings and accessibility to markets. They tended to be established within easy reach of large towns, where the air was clean and where plentiful supplies of pure water were available from local streams. Such factories are to be found at Dartford, Maidstone, by the streams of central Lancashire (Darwen), on the Kennet in Berkshire and in similar situations.

Of recent years the widespread use of wood pulp as a paper-making material has profoundly affected the localisation of the industry. Wood-pulp requires a vast amount of cheap power, and pulp factories thus tend to be situated where water-power is found in close proximity to the sources of raw material. Cheap and efficient transport also is necessary for carrying the logs and other raw materials to the places where power is available and for exporting the pulp. Such conditions are found on a large scale only in North America, Scandinavia and Germany.

Both coniferous and deciduous trees are used for the manufacture of wood pulp, the most important being spruce. Others are pines, firs, poplars and aspens. From these, two types of wood-pulp are made—mechanical and chemical. Mechanical wood-pulp is obtained merely by grinding the chipped logs in contact with water; chemical wood-pulp is produced by boiling the chipped wood with alkaline or acid reagents. The former method retains all the impurity of the wood in the pulp, whilst the latter process extracts the greater part of the impurity and gives a finer product. Mechanical wood-pulp, being impure, brittle and easily discoloured, is used for newspaper and other cheap varieties of paper, whilst chemical wood pulp is used for better quality paper.

UNITED STATES.—In the United States the combination of water-power and spruce forests in New England and the region of the Great Lakes made these areas the greatest paper manufacturing districts in the country. Despite the large production, however, enormous quantities of pulp and newspaper are imported from Canada. Better quality paper from wool and rags is made further south in the textile region, *e.g.*, at Holyoke and Philadelphia.



[*By courtesy of the Canadian Pacific Railway.*

A HUGE CANADIAN PULP AND PAPER WORKS AT GRAND MÈRE.

CANADA.—The vast forests, the abundance of cheap water-power, the presence of cheap water transport and the large market available in the United States, have caused the Canadian wood-pulp and paper industry to develop enormously of late years and to become the largest in the world. Sault Ste. Marie, between Lakes Superior and Huron, has the largest pulp mill in the world. Other important centres are the Chaudière Falls near Ottawa, the Montmorency and Shawinigan Falls near Quebec; and the Saguenay Falls east of Quebec. British Columbia and New Brunswick are other important pulp-producing provinces.

IN NEWFOUNDLAND, where water-power and timber are present in abundance, the production of wood-pulp and paper is one of the leading occupations. The greater part of the output is sent to Britain, mainly for newspaper production.

EUROPE.—The Scandinavian countries—Norway, Sweden and Finland—have large areas of forest land drained by rivers which supply both transport and water-power. In each of these countries the export of wood-pulp and paper to Europe is of great importance. Germany has a large production of paper centred in the forests of the mountains where water also is available, whilst the production of pulp and paper in Czechoslovakia and Austria is increasing, particularly in the former with the development of water-power.

The United Kingdom has always maintained a reputation for high quality writing and printing papers, as well as for paper hangings. The manufacture of this class of paper depends for its localisation mainly on the availability of pure water, suitable supplies of which are found in parts of Somerset and Hampshire. For the cheaper types of paper the necessity for importing pulp (which is very bulky) has led to the building of factories on the coast near large markets, such as the Thames estuary near the London market and the Mersey estuary near the market of northern England. The wood pulp so imported comes from Norway, Sweden, Finland, Canada and Germany.

EASTERN COUNTRIES.—In China like Japan very delicate but resistant papers have long been made by hand from the inner bark of the paper-mulberry, but paper factories modelled on those of Western Europe have been established in most parts of Eastern Asia, and are tending to oust the hand-made paper industries, especially in India.

QUESTIONS ON CHAPTER 14

1. Write a brief account of the British iron and steel industry with special reference to (*a*) sources of raw materials and (*b*) geographical reasons for the location of the industry. (*I. of B., Pt.* I, 1931)
2. If you had to start a manufacturing business where would you build your factory ? Choose your own article that you wish to produce, and say why the locality you choose would be the most suitable. (*C.C.S. Prelim., Nov.*, 1930)
3. Give some account of the probable history of *any three* of the following common articles, stating the materials from which they are made, whence these were obtained, and where and how they are manufactured and distributed :—A metal saucepan, a motor tyre, the paper on which you are writing, a tea cup, a cotton shirt, a pair of boots. (*S.A.A. Prelim., May*, 1930)
4. Which are the chief ship-building centres of the British Isles ? Discuss the advantages and disadvantages of each for the supply of coal and iron (*I.S.A. Prelim., June*, 1931)

5. What do you know about the production in the British Isles of artificial silk, paper, steel? (*R.S.A., Stage* 1, 1930)

6. Name an important *inland* iron and steel manufacturing area in England. Name some of the chief towns in the area, and mention the chief products. What raw materials are required for the industry, and where are they obtained? What disadvantage has this area compared with a similar one on the coast? (*C.S., Oct.*, 1929)

7. Write a brief account of TWO of the following areas with reference to the manufacture of articles of clothing:—

   (*a*) the West Riding of Yorkshire;

   (*b*) North-East Ireland;

   (*c*) South Lancashire.

   Name the chief centres of manufacture and the places from which the raw materials are chiefly obtained. (*C.S., May*, 1929)

8. In what parts of the British Isles do you find woollen industries? In the case of one of them, give a more detailed explanation of the reasons for its establishment. (*C.I.S. Prelim., June*, 1934)

9. What are the chief textile manufactures of Scotland? To what circumstances does each owe its situation? How and whence does each obtain its raw material? (*C.S., March*, 1[illegible]5)

10. Name the chief areas and the principal [illegible] concerned in the production of *either* glass *or* iron in the British Isles. What were the local advantages for the establishment of the industry in each area? (*C.S., Jan.*, 1931)

11. In what parts of England [illegible] Wales are the production of Portland cement and of brick[illegible]rying of slate important industries? In each case describe how [illegible]nished substance is produced from the raw material. For what purposes is Portland cement used? (*C.S., March*, 1925)

12. Write a short essay on geographical factors concerned in the localization of industry. (*C.S., April*, 1931)

13. Discuss the causes which enable a particular area to develop large-scale industries, illustrating by some account of the cotton industry of Europe, or of the eastern United States, or of eastern Asia. Add a note on the reasons for changes in the relative importance of manufacturing areas. (*C.S., April*, 1930)

14. Choose any *four* different kinds of cloth (textiles) and say what are the principal raw materials used in the making of them. Mention one town in the British Isles noted for the manufacture of each kind of cloth and one place outside the British Isles from which the raw material is obtained. (*C.S., September*, 1928)

15. On a certain day in London, a man's clothes include a fur coat, a tweed suit and a silk tie. Write a note about each of these three articles of clothing and point out particularly (*a*) from what part of the world the material may originally have come, (*b*) how and where it was probably prepared as an article of clothing. (*C.S., September*, 1929)

16. Select *three* of the following industries:—Iron and steel, shipbuilding, silk textile, paper pulp, and the chemical industry. With regard to each, name one of the chief areas in Europe concerned, and explain the geographical causes that have led to the development of the industry there. (*L.M., June*, 1926)

CHAPTER 15

POPULATION

Man has been able to find a home in nearly every part of the world. From the equatorial regions of torrid heat and excessive moisture to the fringes of the polar ice, he has succeeded in winning a living. Not all of these regions, however, have provided equal opportunity. Excessive cold and scant vegetation have effectually precluded large populations in such regions as the Tundra, whilst too great heat combined with too much rain have equally precluded a dense population in the equatorial lowlands. Moreover, the inhabitants of these regions are generally backward. The Tundra tribes are not merely small in number, but are primitive in development and culture, whilst some equatorial tribes, such as those of the Mergui Archipelago (Southern Burma), are the most wretched specimens of the human race in the whole world.

There are, on the other hand, regions which have proved exceptionally favourable to human development. [illegible] fertile plains of great rivers, such as the Nile, the Ganges and [illegible] Yangtse, have been conducive to the growth of dense populations with a high degree of civilisation, whilst the temperate lands have produced the most efficient and highly developed races of mankind.

Any study of population, therefore, involves an examination of the various factors which influence human development. As food and water are the essentials of life, anything that affects the supply of these is of paramount importance. Food supply depends essentially on climate, so that climate is ultimately the main factor determining the distribution of population. Other factors are the presence of fuel and minerals, the attraction of great trade routes, political causes and religious considerations.

The Influence of Climate

The most densely populated regions of the world were originally those where the climate and the soil combined to facilitate the production of an adequate food supply. Up to the middle of the eighteenth century the most densely populated part of Britain was the south-east, for this, and especially Kent—" the Garden of England "—has the most favourable climate and the most fertile soil. China, with its vast fertile basins, its seasonal rainfall and considerable, though not excessive, heat, has been from remote antiquity a very densely peopled country. The great river valleys and deltas of India have likewise long supported dense populations, though the arid areas of that country, incapable of food production, have remained unpopulated, except in those districts where man has been able to produce food by artificial irrigation. In bygone ages dense populations existed in Mexico and Peru, where remarkable civilisations were built up upon maize and the sweet potato.

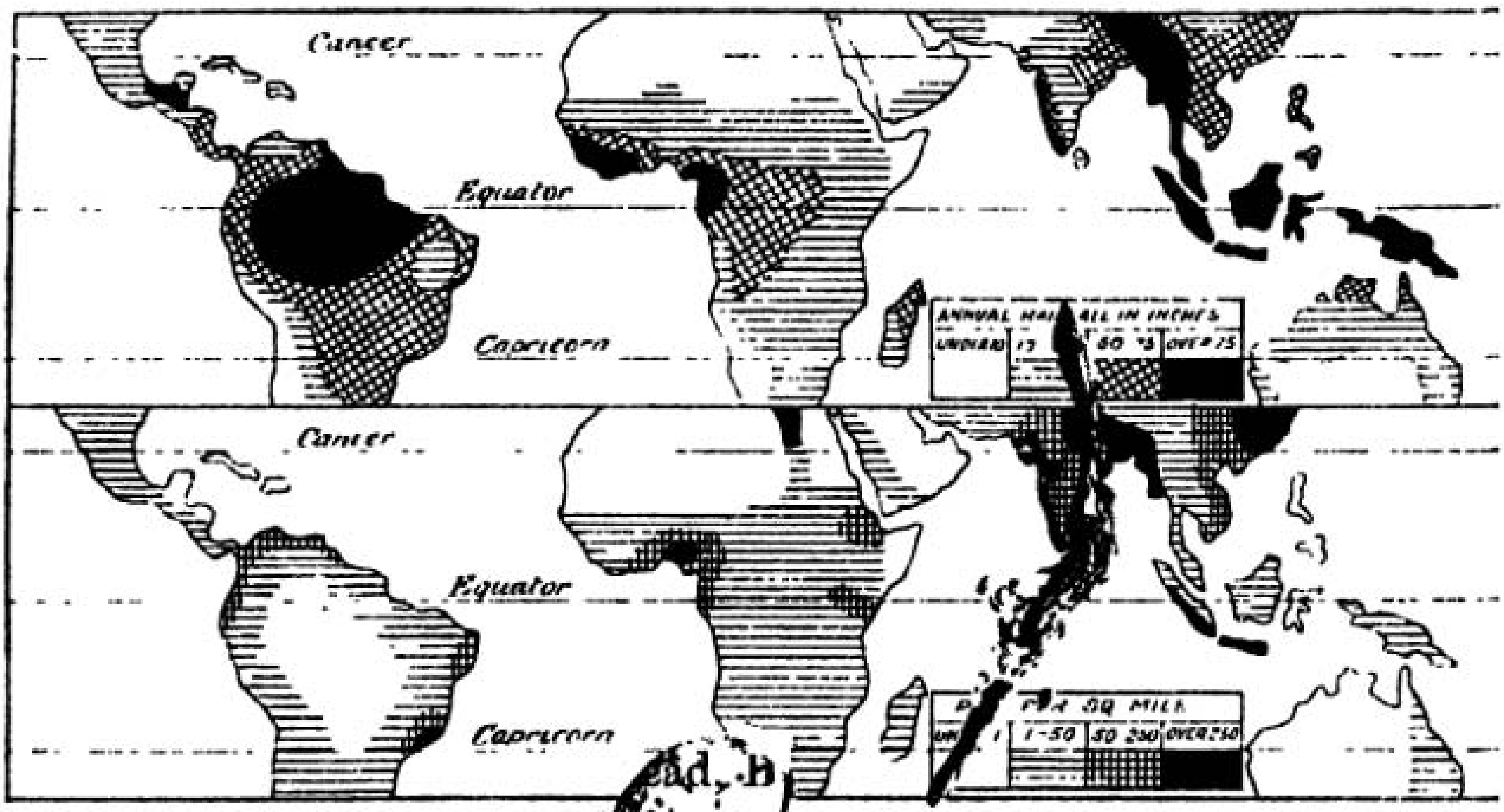


FIG. 118: THE INFLUENCE [illegible]NFALL ON POPULATION DENSITY IN TH[illegible]ROPICS.

Apart from the distribution of population in industrial areas, a consideration of the major climatic regions of the world leads to an approximate outline of the distribution of population. The equatorial forests, with excessive heat and moisture, are characterised by such luxuriant vegetation and such enervating conditions as to be unsuitable for human life. The deserts, with deficient rainfall and little or no plant life, are also regions of sparse or nomadic populations. The monsoon areas of heavy seasonal rains and fertile soil have produced the world's largest and sometimes densest populations. The interior grasslands, prairies or steppes support a pastoral, nomadic population of no great density. These facts are illustrated in Fig. 118.

The coastal lands of the temperate zones are ideal for human existence. Thanks to the moderate rainfall and the equable temperature, life in these lands is pleasant and never difficult, while sufficient food can be produced to support very large populations. The coniferous forest areas are noteworthy for their prolific plant life and numerous animals of a special type, but the climate is too rigorous for a dense population. The Tundra is distinctly a region of privation and provides food for but a few primitive tribes, whilst the Ice Cap region is quite devoid of human life.

The Influence of Fuel and Minerals

The application of coal as a fuel for industrial operations marked a great change in world progress. In industrial countries population tended to concentrate on the coalfields rather than near the sources of food supplies. Rapid progress was made in the manufacture of iron and steel. Machinery came into universal use and steam power generated from coal and water dominated the world's industries. Vast areas of hitherto agricultural or pastoral land were covered with factories and with the refuse from pits. Great cities sprang up, and to feed, clothe and house their rapidly increasing populations, food and materials had to be brought from far and near. Britain was particularly fortunate in her possession of coal supplies, and in the fact that these supplies were so near the seaboard with its excellent harbours. These factors enabled her to forge ahead of all other industrial communities, and her coalfields became the most densely populated areas (Fig. 119) not only in the country itself, bu[illegible]lmost in the world.

It is much th[illegible]ame in other countries where coal has been worked. The population [illegible]nsest round the coalfields, and the population maps of the leading in[illegible] countries of the world coincide to a remarkable extent with maps [illegible]eir developed coalfields and industrial areas.

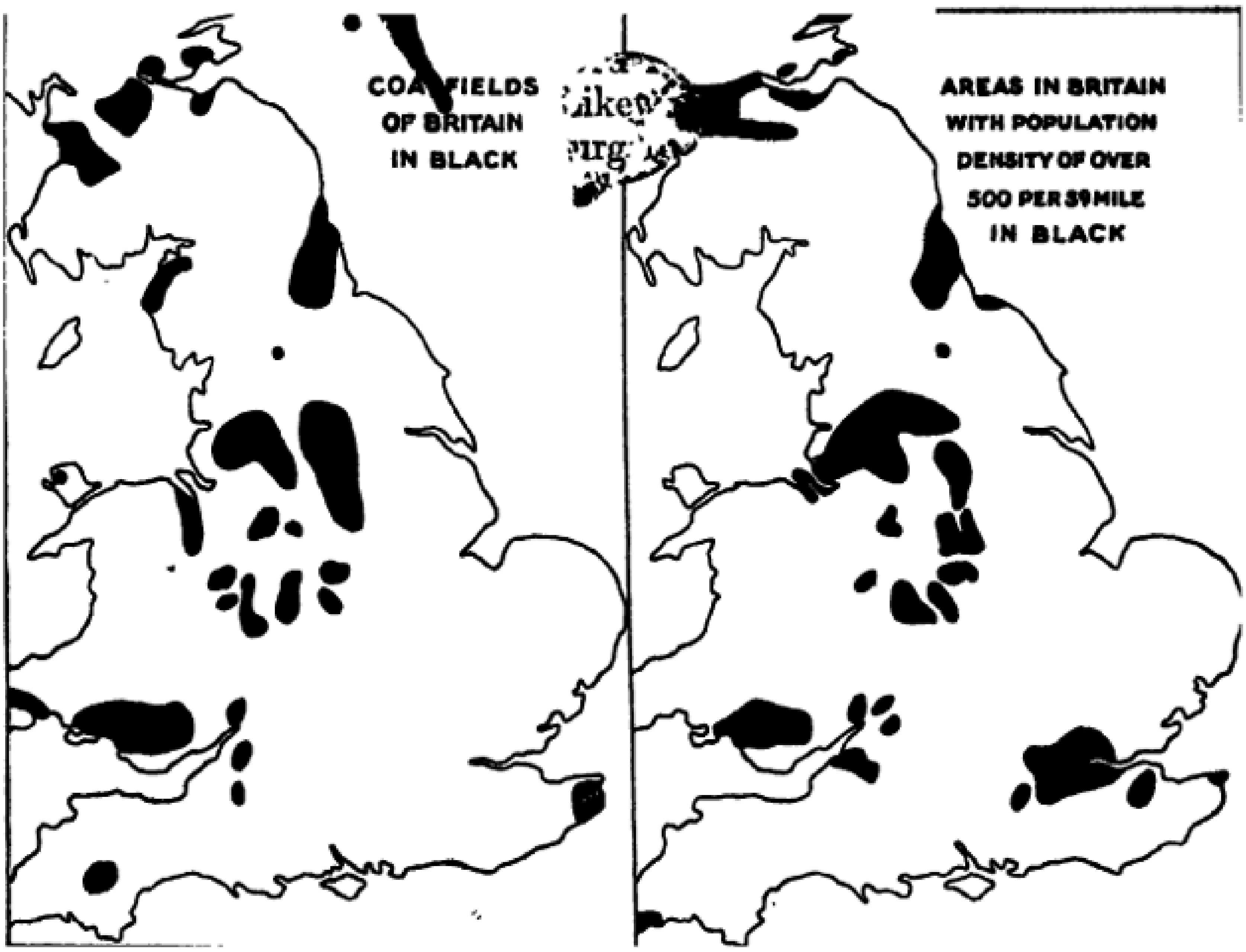


FIG. 119: THE INFLUENCE OF COAL ON POPULATION DENSITY IN BRITAIN.

Other minerals—especially gold, copper, silver and tin—have attracted large numbers of people to districts in which they are found and, in some cases, quite large populations have grown up even where climatic conditions have been distinctly unfavourable to human existence. Well-known examples of such mining concentrations are the Coolgardie goldfields of Australia, where the conditions are those of complete desert, and where water has to be brought from the coast 300 miles distant; and Broken Hill, a silver-lead mining area in the desert region of New South Wales, where agriculture is impossible and the population exists for the sole purpose of mineral extraction. Other examples could be given of a similar type, such as the bitterly cold and inhospitable Klondike gold region of Canada, where thousands of people lived in misery in the years which followed the gradual exhaustion of the gold-bearing areas.

Unless the climatic conditions are reasonably favourable, such mining communities cannot be permanent, and, as the minerals become exhausted, the population gradually disappears. Where the climate is favourable, however, a population which was attracted at first by the presence of minerals may remain to follow agricultural and pastoral occupations. This factor was of the greatest importance in the development of Australia. Miners who had been unsuccessful or had worked until the mines were exhausted turned to agriculture as a means of livelihood and, in doing so, changed the continent from a mining country to one which is now primarily agricultural. The same thing happened in the far western region of North America, which, originally opened up by miners, now [illegible] prosperous population largely by agriculture or pastoral farming.

South Africa furnishes examples both of the attractive power of minerals and of large movements of population. In 1885 the discovery of gold in the Witwatersrand (Transvaal) caused a rush of people to the mining districts. The native population was employed to work the mines, and large numbers of Asiatics were introduced. To-day, the majority of the population of the Transvaal is concentrated in the mining areas, especially in the two cities of Johannesburg and Pretoria, which contain one-third of the total white population of the Transvaal. The agricultural districts, on the other hand, are very thinly populated.

The rich iron-ores of Gellivara and Kirunavara in northern Sweden afford another example of mineral wealth which is obtained under climatic conditions entailing a certain amount of hardship. This is indicated by the fact that the turbines of the power-station at Porjus, which provide power for the railway from Lulea to Narvik, have to be placed 150 feet underground to prevent freezing. Nevertheless, the area is a hive of industry and supports a considerable population.

The Attraction of Great Trade Routes

Places at strategic points on the world's great trade routes have always attracted populations. Such concentrations tend to be permanent, but changes in the course of a route will cause population to migrate. When, for example, the main east-west routes between China, India, Europe and North America have changed from time to time, there have been corresponding migrations of population. This is particularly noticeable when land routes by caravan have been superseded by sea routes by ship, or when caravan routes have given way to rail routes. It has to be remembered, however, that the rail routes across the great continental tracts have been largely influenced by caravan routes and that the latter in turn have been mainly determined by the physical conditions (especially relief) of the countries traversed. The caravan route from Europe to Asia *via* the Ural Gap at Ekaterinburg lost much of its old importance on the opening of the sea-route to the East *via* the Suez Canal, but the Trans-Siberian railway has largely restored that importance and once again brought prosperity to some of the old caravan route towns.

The railways constructed in "new" countries have contributed in no small measure to the movement of population, and each stretch of completed route has been closely followed by settlement on either side of the line. The influence of the Canadian transcontinental lines in this respect is most noticeable. With many other geographical factors favouring its development, the city of Vancouver probably owes its remarkably rapid growth more to its position as the western terminus of the Canadian Pacific Railway than any other factor. Likewise the Panama Canal has contributed likewise [illegible] growth of population on the western coasts of America by opening up those coasts to speedier and more frequent shipping traffic.

Political and Religious Factors

Over a long period in the world's history, political influences and religious factors have been markedly instrumental in causing changes in the distribution of population and in the growth of industrial areas. The Biblical story of the great migration of the Israelites from Egypt to the Promised Land attributes the movement to political differences and religious oppression. This migration led to the establishment of the Jewish kingdom in Palestine, with its accompanying increase in population and the development of prosperous towns by a people which had previously lived in slavery. In 1620 the nonconformist Pilgrim Fathers left England in order to escape from political oppression and to seek religious freedom. They succeeded in reaching North America, and founded a state which has become one of the greatest industrial and commercial countries of the world. In the sixteenth century political oppression caused numbers of Italians to leave their country for France, and so the great silk industry of Lyons was brought into being by silk workers from Milan. The industry was further assisted by the French Government, and so firmly was it established that Lyons remained until recently the most important silk manufacturing city of the world.

In the seventeenth century, again, political and religious troubles caused large migrations of Protestant Huguenots from Catholic France to England and South Africa. In England, thanks to the encouragement they received from the Sovereign, they were instrumental in creating and in developing silk industries at such places as Spitalfields (London) and Norwich, and later at Macclesfield and Leek. Geographical factors, however, were unfavourable to the growth of silk manufacture on a large scale in this country. In South Africa the Huguenots introduced vine culture, for which the Mediterranean climate of the south-western part of the Cape of Good Hope was extremely favourable. And it was in South Africa that political troubles and dissatisfaction with English rule caused the Boer farmers to trek northward from Cape Colony into the Orange Free State and the Transvaal, now two of the most populous and flourishing states in the Dominion.

Ireland affords what is probably the world's worst instance of the disastrous effects of selfish political action by a sovereign state. In 1829, the English parliament passed a law which took away from the small Irish Peasants the right to vote, and so placed them much at the mercy of their English and Irish landlords. Farm rents became so high that extreme poverty followed and the people had to live mainly on potatoes, although the rich landlords at the same time were in a position to export wheat, barley and livestock. In the years 184[illegible]–1849 the potato disease ruined the crops and the bulk of the people starved, while continued political difficulties forced millions of people to leave the country and establish homes overseas, especially in the new world. Between the years 1846 and 1917 no less than 5½ million persons emigrated from Ireland, and while in 1846 the population of that country was 8½ millions, in 1914 it had decreased to less than 4½ millions. In 1801 the density of population in Ireland was greater than in England itself, whereas a century later the density was less than that of Scotland. Nowadays, the Irish are more numerous in America than in their own mother country.

Emigration

The principal causes of emigration are –

1. OVERCROWDED OR UNPRODUCTIVE SOIL OF THE HOME COUNTRY. Germany, Sweden, Italy and the industrial areas of Europe generally provide examples of this cause. In Germany, a rapidly increasing population in a land where large areas are infertile has forced great numbers of people to seek homes in other lands. In Sweden, also, there are large tracts of infertile land, and the inhabitants have been compelled to seek more favourable conditions. In Britain, the land on the whole is fertile enough but the population is so dense that, without emigration, the islands would become overcrowded.

2. **Political and Religious Differences and a Desire for Mental and Spiritual Freedom.** Examples of emigration due to these causes have been discussed above, the more noteworthy instances being those of the Pilgrim Fathers and of the Huguenots.

3. **The Attractive Prospects afforded by a New Land.** Canada, Australia, New Zealand, South America and South Africa are all countries of great mineral and agricultural resources. They have all offered opportunities of considerable monetary return in a short time and have thus attracted immigrants from all parts of the world. In Canada, Australia and South Africa, especially, the presence of precious minerals, such as gold or diamonds, has caused enormous numbers of people to flock to these countries in the hope of acquiring wealth rapidly.

4. **Immigration Schemes** fostered by governments—mainly by "new" countries which desire to encourage the inflow of a good type of settler—have caused large numbers of people to emigrate. Free gifts of land, or partial gifts of land and free or reduced passage money, have from time to time been offered as inducements to people to emigrate to a new land. Large areas of Canada, especially, have been developed by schemes of this nature.

Emigration has naturally been directed principally to countries which are under-populated and where land is cheap. The emigrants have been mainly of European descent, particularly British, German, Italian, Scandinavian and Spanish, whilst [illegible] to which they emigrated most largely have been the United States, Argentina, Canada and Australia. Depressed economic conditions in the world of late years, together with immigration restrictions imposed by certain countries largely as a result of their own economic difficulties, have caused a falling off in the number of emigrants to an almost negligible quantity. Indeed, lately, the number of people returning from the Empire to Britain has exceeded those emigrating from Britain to Empire countries.

Successful colonisation depends upon several factors, of which the principal is the climate of the country to which the emigrant belongs. An emigrant cannot usually live successfully in a country where the climate is of the opposite extreme to that in which he has been brought up. For this reason, people from temperate countries are able to adapt themselves more successfully than other peoples to conditions either of intense heat or of intense cold. Europeans, Chinese, Japanese and Indians all make good settlers, but Chinese and Japanese have special advantages because the wide range of climate of their own countries enables them to adapt themselves to other conditions with reasonable ease.

The British have proved to be exceptionally good colonisers, although in tropical countries they, in common with other white men, always suffer from the handicaps of tropical diseases. In this respect, however, matters have improved to an extent which to the early settlers would have been incredible. Many tropical fevers have yielded to scientific research, and the death rate from them has rapidly decreased. Malaria, the commonest of all tropical fevers, is no longer the troublesome scourge that it used to be, and preventive measures have been discovered which make its extermination over many areas quite within the bounds of possibility. Yellow fever is a more difficult problem, although in Cuba and in the Panama Canal zone this, too, has been attacked so successfully as to be almost rare. In West Africa it is still prevalent, though unstinted efforts are being made to find a prophylactic and a cure.

Sleeping-sickness (beri-beri) is one of the diseases which is fatal both to the native populations and to white settlers in parts of Africa, and the only possible means of eradication appears to be the complete extinction of the tse-tse fly, which is the carrier of the disease. No area of " fly " country can be properly settled and developed until this scourge is eliminated.

In connection with the transmission of disease, a new and very important state of affairs has arisen in modern times with the rapid advance of air transport. This has made it possible to transmit certain serious diseases over long distances, and the danger of introducing such diseases into temperate lands has already been recognized by the authorities, who are attacking this new danger through the instrumentality of the League of Nations.

Population of the Continents

The distribution of population in the continents illustrates the fact that the dense populations of the world are to be found on or near developed coalfields, or in those regions where climate and soil are conducive to an abundant food supply, or near the great rivers which provide abundant water supplies as well as facilities for transport and communication. As we have already observed, the English, Belgian, German, French and American coalfields are all highly industrialised and densely populated areas, although undeveloped coalfields in other parts of the world, as, for example, in China and the U.S.S.R., still have only a sparse population because of the difficulties of exploitation or because the people of these areas are more backward than those of the western countries. So, too, the great river valleys of the monsoon lands, such as the Ganges, aided by a favourable climate and fertile soil, support dense populations, but the desert regions, such as the Sahara, where climate is entirely unfavourable, support only a few nomadic tribes. In all the continents, therefore, the population is unevenly distributed.

Africa. In Africa, the most densely populated part is along the Nile Valley, which is followed in density by the wet coastlands of Upper Guinea and by the ports and mining centres of South Africa. Elsewhere, the continent is sparsely inhabited, largely because of unfavourable climatic conditions, although it is worthy of note that the equatorial Congo basin, owing to its high altitude, has a greater density of population than the equatorial Amazon basin of South America.

Asia. The greatest density of population in Asia is in the hotter and wetter south, notably in India and China, whilst the high lands, such as Tibet, and the cold and inhospitable far north, are sparsely populated. The vast steppe lands of Siberia support a small population, but in the cultivated areas to the south the number of inhabitants is greater. Density in China is assisted by the isolation of the country and by the fact that, whilst there are no colonies to which the population can emigrate, the entry of Chinese into other countries is rigidly restricted, especially by such countries as the United States and Australia. Japan, too, is densely populated, not because of her productive soil (much of the land is mountainous and barren), but because, like China, she has no colonies and no outlets for her rapidly growing population. It is for these reasons that China and Japan are looking towards Manchuria as a solution to their population problem, while Japan is endeavouring to colonise Corea.

Australia. The population of Australia is very unevenly distributed, being mainly concentrated along the coastal strips, especially in the south-east. Here, in Victoria and New South Wales, there is a good rainfall and the fertile land [illegible] a fairly dense agricultural population. Inland, beyond the Great Dividing Range, the population is mainly engaged in pastoral pursuits and is therefore more scattered. Northwards, the climate becomes hotter and not quite so suitable for white occupation, so the population is even less dense. The interior is for the most part unpopulated, though pastoral and mining industries support isolated settlements. In the south-west corner of the continent a Mediterranean type of climate enables a fairly dense population to flourish, but in the south, from Albany to Adelaide, the coast is barren.

Europe is more densely populated than any other continent and the population is more evenly distributed than that of other continents. The density on the coalfields has already been mentioned. Elsewhere, the most densely populated part is the Plain of Lombardy (northern Italy), where a suitable climate and fertile soil are favourable to cultivation, while abundant water-power has favoured the development of manufactures. The highlands, such as the Alps and the Scandinavian and Iberian plateaus, the colder regions to the north, and the more extreme eastern parts, are the most sparsely populated regions. In Scandinavia and Iberia the bulk of the population is centred on the coastal plains, whilst in Switzerland the density of population around such places as Berne, Zurich and Basel, is due to the concentration of population at important traffic points connected with the tourist trade and to the presence of industries making articles of high value and small bulk, *e.g.*, watches and jewellery.

NORTH AMERICA has its greatest density of population in the east. Apart from the question of natural resources, such as coal, iron and water-power, this is accounted for partly by the fact that the east coast is nearer Europe and was therefore the first part to be settled. Consequently, both in Canada and in the United States the density of population decreases from east to west. Northern Canada, inhospitable and largely undeveloped, is sparsely populated. So, too, are the mountainous regions of both countries and the desert area in the south-west of the United States.

SOUTH AMERICA has a dense population only around the great towns—Buenos Aires, Rio de Janeiro, Montevideo, Caracas, Bogotá and Valparaiso. The east coast has the greater population because it is nearer Europe and North America, but the opening of the Panama Canal is tending to counteract this factor. The most sparsely populated regions are in the equatorial lowlands of the Amazon basin, where the dense vegetation crushes out man; in the deserts of Chile, Peru and Patagonia, where the arid climate crushes out both man and vegetation; and in the far south, which is similarly barren. Political unrest is a contributory cause of the sparse population of South America as a whole.

The following Table shows the density of population in a few selected countries.

Density of Popu[illegible] in Certain Countries.

	[illegible]ULATION (000,000's)	DENSITY *per sq. mile*
Java	42·0	818
Belgium	8·2	699
Netherlands	8·2	651
United Kingdom ...	46·4	490
Japan	67·2	456
Germany	66·0	363
Italy	42·2	354
China...	465·0	300
Czechoslovakia ...	15·0	272
France	42·0	197
India	353·0	195
Spain	24·0	122
Malaya	4·0	76
U.S.A.	122·8	41
Sweden	6·2	39
Egypt[1]	14·2	38
Norway	2·8	23
U.S.S.R.[2]	165·7	20
Union of South Africa	8·4	18
Chile	4·3	15
New Zealand ...	1·5	14
Argentina	14·0	11
Canada	10·5	3
Australia	6·6	2

[1] Population per sq. mile of the settled land surface is 1,014.

[2] Density of 62 in Russia in Europe and of 4 in Russia in Asia.

Races of Mankind

The races of mankind can be divided broadly into three main classes: (1) Mongolian, (2) Ethiopian and (3) Caucasian.

The Mongolian Race, in its different branches, includes the Yellow races of Asia, the American Indians and the Eskimos. The most important are the Chinese and Japanese. The feature common to all branches of the Mongolian race is their straight, black hair.

The Ethiopian Race includes the peoples originally inhabiting Africa south of the Sahara and the aborigines of Australasia. Their skin is black, or nearly so, and their hair curly or woolly.

The Caucasian or " *White* " *Race* is the most widespread and includes all Europeans (except those of Tartar descent in Russia and the Balkans and others of the Mongolian race, such as Lapps and Finns in the Northern Baltic region); nearly all the peoples of India; Arabs, Egyptians and the North African peoples; the inhabitants of the Near East, Persia, Armenia and Afghanistan. The hair is generally wavy and the skin white or brown.

Languages

The languages in use to-day are mainly of *Teutonic* or *Romance* origin, branches of the Aryan languages found in almost all places where the " white " race has penetrated likewise.

The teutonic language is best exemplified in German, which is confined almost solely to Germany and is used only to a limited extent in commerce.

English, a teutonic language with a strong romance influx, is widely used and is one of the chief languages of commerce. It is used in all the British dominions and in many of the Colonies, and in the United States.

Spanish and Portuguese, both romance languages, are widely used in commerce, particularly in Central and South America.

French, another romance language, is widely used in commerce, and is the language most used in diplomatic circles.

In Asia and Africa there are hosts of languages, some of them little more than dialects while others have been made famous as a result of their use by the oldest civilisations of the world. Of these the language of India (a branch of the *Aryan* family), of Assyria, Arabia and Abyssinia (of the *Semitic* family) and of Egypt (of the *Hamitic* family) take first place and, subject to local variations, are spoken by millions of people in Asia and Africa. The language spoken by the inhabitants of China, Tibet, parts of India and Japan, belongs to the *monosyllabic* family, while in central Africa there are innumerable dialects which cannot be classified into any families and which are negligible in world commerce.

Swahili and *Hausa* are used extensively for commercial intercourse in East and North Africa; "*negro English*" is the language of the west coast of Africa; "*pidgin*" *English* is the medium used for trading purposes in the Chinese ports, while the *Malay* language is the recognised tongue in the Malay Archipelago.

QUESTIONS ON CHAPTER 15

1. Indicate some of the causes of the high density of population in parts of western Europe, *or* in parts of the North-eastern United States, *or* in South-eastern Asia. (*C.S., April*, 1930)
2. In the case of *either* South America *or* China state and explain the geographical factors that have led to the growth of relatively dense populations in certain parts. Indicate the regions you refer to on a sketch-map. (*L.M., January*, 1930)
3. Describe the distribution of population in *either* South America *or* Australia, explaining briefly why some areas are fairly densely peopled while others are almost uninhabitable. (*C.S., April*, 1928)
4. Account for the much greater density of population in South-Eastern Asia than in South-Western Asia. (*L.M.*, [illegible], 1926)
5. Where in Europe (outside the British Isles) [illegible] two areas of densest population? Account for this exceptional density in each case. (*L.M.*)
6. Write a brief explanat[illegible]ount of the geographical factors determining the [illegible] population the world over. (*B.U., Inter.*, 1925)
7. Draw a sketch-map to show the density of population in South America. Comment briefly on the geographical conditions influencing the facts shown. (*L.M., Jan.*, 1934)

CHAPTER 16

CENTRES OF COMMERCE AND INDUSTRY

ORIGIN AND GROWTH OF TOWNS

MAN is a gregarious animal, and from pre-historic times he has tended to congregate into communities, some small, some large. At the present time the bulk of the world's population is gathered together in groups in towns, and it is both an interesting as well as a profitable study to enquire into the various geographical circumstances which have operated to bring this about.

The towns in a modern community may be broadly classified as industrial, commercial [illegible] route towns. In many cases, the growth of a town is due to several causes, although the site of the original settlement may have been chosen for one specific reason. London, for example, was chosen for settlement [illegible] flint workers at a very early date, but its later growth was due to its rise to importance first as a route centre, and later as an industrial city and a commercial centre.

As the division of towns into industrial, commercial and route centres is merely arbitrary and by no means watertight, the examples given below to illustrate the various points may belong to two or even three of the groups. It is clearly impossible to place such towns as London, New York, and Buenos Aires in only one of the three divisions; they could serve as examples of all three divisions, while other towns, such as Cairo, could serve as examples of two of the divisions.

Industrial Towns

Industrial towns are very little more than gigantic workshops, and they owe their growth almost entirely to the presence of some source of power, which has enabled manufactures to develop on a large scale. Nevertheless, such a town is seldom built up on industry alone. Originally it may have been a small place which had some degree of commercial importance in its neighbourhood owing to certain geographical controls. Following the discovery of a local source of power, such as coal, however, the town may have been enabled to develop rapidly and to assume a multiplicity of activities, though it may still have only one outstanding industry. Such towns tend to grow until they embrace all the communities in their immediate vicinity and until their boundaries encroach on those of another urban area of similar type.

Coal, as we have seen, is still the pre-eminent source of power in industry, and the great industrial towns of the world are to be found mainly on coalfields. At first, these towns were expanded without thought for anything but the immediate convenience of industry, with the result that vast areas of slums grew up, and the crowded and insanitary state of many districts led to physical degeneration, misery and disease. Gradually, the lack of air and sunshine in great urban areas would cause those of the inhabitants who could get away to move into the surrounding country, leaving the central area to industry and business, and establishing wide, surrounding suburbs for residential purposes. The city grows rapidly outwards, more and more of the countryside disappears, and zones or quarters with different trades, different customs and different conditions are created, as in the east and west of both London and New York.

Many an industrial city is famous for a particular industry which has arisen as the result of special factors. Bradford, Huddersfield, Halifax and other towns of the West Riding are mainly engaged in the manufacture of wool textiles. The factors favouring cotton manufacture in Lancashire led to the growth of specialised cities such as Oldham, Rochdale, Bolton, Preston, Burnley, Bury and Blackburn. Sheffield, formerly a small market town well situated for collecting and distributing the products of the nearby dales, is at the present day an essentially industrial centre, thanks mainly [illegible] its world-famed cutlery industry, based on local coal, iron [illegible] grit and good water. Newcastle, originally a small seaport and fishing port of no great importance, has now become a vast centre of iron, steel, shipbuilding and coal exporting industries.

Birmingham owes its extraordinary growth not only to coal, but also to the moulding sands which helped it to develop a brass-founding industry. It is now a city of hundreds of industries, although brass-founding is still important. Clay and coal were the cause of the great agglomeration of industrial cities in the Potteries, whilst the coal of South Wales brought about the growth of numerous industrial and mining towns in the Rhondda and Ebbw Valleys.

Power obtained from rapids and waterfalls caused the establishment of those cities, known as " Fall Line " towns, in the east of the United States. Manchester (N.H.), Lawrence, Fall River, Springfield, Waterbury, Trenton, Richmond, Raleigh, Columbia and Augusta are located on rivers at points where they rapidly descend from the Piedmont Hills to the coastal plain. The industrial towns of Switzerland and Sweden likewise owe their growth to industries based on water-power, as also do a number of large towns in the neighbourhood of the Great Lakes of North America; for example, the twin cities of Minneapolis and St. Paul—now great industrial centres dependent on the cheap electrical power derived from the Falls of St. Anthony, the highest point of navigation on the Mississippi.

Seaports are to be classed as commercial rather than industrial towns, but in many cases the facilities for obtaining raw materials have caused industries to spring up in their neighbourhood. Instances of this kind are the jute industry of Dundee; the oil-cake industry of Hull; the soap industry of Marseilles (the great French Mediterranean port—British coal being a factor in this case); the tobacco, chocolate and sugar industries of Bristol; and the cotton industry of Bombay.

Many centres of agricultural districts have become industrial towns manufacturing agricultural machinery and implements, since it is more profitable to make these products near the market than to import them from the coalfields. Notable examples are Lincoln, Norwich, Ipswich and Bedford in England; and Chicago, Moline and other places in the United States. Chicago, on Lake Michigan, lies at the boundary of the great wheat and maize belts, and has grown enormously in recent years with the rise of its great stock-rearing and meat-canning industries.

Mining towns have sprung up with extraordinary rapidity in localities where precious metals have been found, and sometimes the growth has been permanent because of the presence of other geographical factors. San Francisco (California, U.S.A.) was at one time merely a tiny port acting as an outlet for the cattle ranches of California, but the discovery of gold in the Sierra Nevada caused its population to increase in one year from 1,000 to over 15,000. Likewise the occurrence of gold in the Witwatersrand caused Johannesburg to grow from a native village to the largest town in South Africa, with a large white population. Dawson City, in the Klondyke region of Canada, was non-existent before 1896. Three years later it had a population of 25,000, although the partial exhaustion of the gold mines has since caused a reduction to less than 1,000. Coolgardie and Kalgoorlie in Western Australia are two similar towns, dependent solely upon gold-mining, which remained large centres of population so long as mining was profitable, but rapidly decayed as the supplies of gold were exhausted. Recently, there has been a revival and Kalgoorlie is relatively prosperous once more.

Scientific invention combined with suitable climatic conditions have caused the phenomenal rise of Los Angeles in southern California to the position of the world's leading centre of the film industry. This city has now a population of about 1¼ millions, compared with 50,000 in 1890.

Another group of town types comprises health resorts such as Brighton, Buxton, Le Touquet (France), Simla (India) and Miami (U.S.A.). These towns are the complement of the growth of manufacturing cities. The gradual increase in size of the larger industrial towns, with their accompaniment of smoke and dirt, causes the inhabitants of such towns to flock to the sea or to the country in search of relaxation and fresh air. As a result, what were once mere bracing upland villages or merely small fishing ports on easily accessible coasts, have in many cases now become important holiday and health resorts. Many such resorts have been artificially created by the railway companies, who have fostered their growth by wide publicity, and by offering excellent transport at low prices.

Commercial Towns

Unlike industrial towns, commercial towns are not congregated in defined districts, nor are they always of large size. In those cases where both industry and commerce are carried on the population may become enormous, and many of the great industrial towns of the present day were formerly commercial or market towns.

Usually, commercial towns are established at the junction of several routes. The original market town grew up at the junction of roads from different districts where it was easiest for the merchants over a wide area to meet for the exchange of their goods. Such towns were established, therefore, at places where the physical features of the district were such as to cause a number of roads to converge on a certain spot, as, for example, Birmingham and Rome (Italy). Later, the convergence of railway routes had much the same effect, and led to the growth of such junction towns as Chicago and Atlanta in the United States, and Toronto and Winnipeg in Canada.

Likewise, the meeting place of hill and plain, and especially at a point commanding a pass where routes converge on an opening through the hills, was an obvious choice for the site of a town or port. Bombay, for example, stands near passes commanding routes through the Western Ghats from the coast to the interior. Towns grew up, too, on the outer border of colonial empires where command over routes into foreign lands was secured. The Romans had numerous towns of this type along the Rhine and Danube valleys, such as Cologne, Ratisbon (Regensburg) and Mainz.

The limit of tidal navigation on an estuary or river mouth is another favourite site for a town, as, for example, Wisbech and Teddington in England, and the several " Fall Line " towns in the east of the United States. The heads of fiords and estuaries have provided numerous commercial sites, as also have the mouths of estuaries where deep water occurs close to the shore or where narrow creeks open out into swiftly running estuaries. Oslo (Norway), Hull, Liverpool and Rangoon (Burma) are of this type.

River deltas, again, determine the sites of towns. Such towns may be at the open mouth of a delta, as Alexandria (Egypt), or they may be to one side of the delta to avoid silting by tidal currents, as Karachi (India) and Marseilles. More frequently towns spring up at the head of a delta, as, for example, Cairo (Egypt), because such a point is obviously a suitable crossing point for routes. Towns also arise at points where rivers may be easily bridged or forded, or where islands in a river facilitate bridging; for example, Paris (France), Montreal (Canada) and Gloucester. Other towns arise where canals meet rivers or estuaries, such as Ellesmere Port on the Mersey; Limehouse (London), and Beaucaire (France) at the junction of the Canal du Midi with the Rhône. Confluence towns, such as Coblenz (Germany), Lyons (France) and Tewkesbury, are very numerous, whilst the meeting points of several river routes are obviously suitable sites which tend to support distinctly important towns. Paris, Manaos (Brazil), Warsaw (Poland) and St. Louis (U.S.A.) are examples.

Many seaports, as we have seen, have developed into important *industrial* towns, but as a rule they owe their rise to *commercial* factors, since the necessity for a break in bulk arises at such places on the change from sea to land traffic. Many of the largest towns of the world are seaports, as, for example, Sydney (New South Wales) and Calcutta (India), and, generally speaking, the size and importance of a seaport depend upon the productiveness and accessibility of its hinterland, *i.e.*, the land in the immediate vicinity for which it serves as an outlet (*see* Chapter 20).

Re-distribution of cargo is necessary also at points where a river changes its direction, hence at bends in large rivers important commercial centres spring up, as Magdeburg (Germany), Liége (Belgium) and Toulouse (France).

Towns arise at points which are strategically important from a military or naval standpoint, and important towns are therefore to be found in the neighbourhood of castles and border fortresses; on islands in either lakes or marshes; at places which command river mouths, straits or entrances to countries; and on hills surrounded by a loop in a river (providing easy means of defence). Durham, Shrewsbury and Hereford are of the latter type. Peshawar and Quetta (India) and Carlisle are fortress towns. Mexico City is established on an island in a lake; Ely on an island in a marsh. Hong-Kong (China), Mombasa (Kenya) and Bombay all command river mouths or entrances to a country; while Singapore (Malaya) is in a strategically important position commanding the Malacca Straits on the route to the Far East. Religious influences are frequently important. Shrines and holy places especially have always attracted population, and such places often become considerable towns, such as Benares (India), Lourdes (France) Mecca (Arabia), and Lhasa (Tibet).

Other factors determining the sites of commercial towns have been forest clearings near streams; the presence of mineral springs; the existence of cultivable land on sheltered bays or fiords; and, most commonly of all, the existence of springs affording ample supplies of good water. This last is very characteristic of the limestone and chalk escarpments of England, where numerous Anglo-Saxon villages were founded in the immediate neighbourhood of natural water supplies at the foot of the hills.

All such conditions have contributed to the growth of small towns of one kind or another, but again it may be emphasised that towns rarely or never grow into large and important centres of commerce unless more than one factor is present. Indeed, the greatest of the world's cities owe their growth to a combination of several contributory factors. London, the world's leading example, had and has a multitude of advantages. It is at the head of the important Thames estuary and opposite the commercially important continental rivers of the Scheldt and the Rhine; it is at the head of ocean navigation on the Thames; it is a "bridge" town and route centre of the greatest importance with routes radiating northward and southward through gaps in the surrounding hills; and it was from very early times, as it is today, a market centre for agricultural England. Now, in addition to being a first class port, and a commercial and administrative centre, it is, of course, an industrial town with an endless variety of productions catering for the needs of its own enormous population as well as for those of the nation as a whole and for those of many foreign countries.

Route Towns

Transport is probably the most vital factor in commerce, and means of communication are important factors in determining the establishment of commercial towns. One writer has said that the location of every city of importance in the eastern part of the United States has been determined by the possibilities of water transport. Railway transport has superseded road transport, and even water transport in large measure, but, in practice, the establishment of railway routes is as much influenced by the surface configuration of the land as is the construction of roads, whilst both find their easiest direction along important river valleys. Thus the sites of practically all route centres are largely influenced by physical features.

In the past, all the great overland routes were road routes, and in certain cases the site of towns was partly determined by the distance which could be travelled on horseback in a day. Thus, on the Great Iberian Way which followed the great plain of Europe through Germany, Flanders and France to Spain, the stopping places are marked by towns at roughly equal distances apart. From Paris the route went to Orleans, from Orleans to Tours, from Tours to Poitiers, from Poitiers to Angoulême and from Angoulême to Bordeaux. The same route is followed to-day by the railway from Paris to Bordeaux.

In other cases the position of important route towns has been determined by the ends of lakes for the reason that at such points routes diverge and a change in mode of transport often takes place. A study of practically any map at once shows the importance of these sites, of which notable examples are Chicago and Duluth (U.S.A.); Toronto (Canada); Geneva (Switzerland) and Irkutsk (Siberia).

Where a route is compelled to go through a pass or defile owing to the necessity for following the easiest route, towns of great importance spring up because such towns, apart from being route centres, are essentially strategic. Examples are Vienna (Austria), Bâsle (Switzerland), Dresden (Germany) and Bombay. Winnipeg, situated in the narrow neck of land between Lake Winnipeg in Canada and the United States' border, has become the focus of all east-west routes across Canada. St. Louis, just below the confluence of the Mississippi and the Missouri, has become the focus of routes from north, south, east and west. Montreal, a natural route town, the head of ocean navigation, built on an island for defence but easily connected with the mainland by a bridge, has become the largest city in Canada.

Bridge towns are among the most important types of route towns, for, before the industrial era when town development was primarily based on routes from one part of a country to another, route towns or bridge towns were established at points where the many swamps and rivers had to be crossed by bridges and viaducts. Towns of this type are York, London, Amiens (France) and Gloucester. The construction of bridges across rivers near the head of tidal navigation caused such places as London, Lincoln and York to become nodal towns for routes across the river valleys. Nodal towns of this kind are to be found, also, on great railway routes where rivers are crossed. In many cases these towns serve as collecting centres for produce brought by the river, as, for example, Kurgan, Petropavlovsk, Omsk, Tomsk and Krasnoyarsk, all on the Trans-Siberian Railway. The Salt route across Bavaria helped to establish the German towns of Munich, Augsburg and Ulm at crossing points of the Isar, Lech and Danube respectively; but the relative importance of these three towns at the present time is due to several other factors.

The Railway Era commencing about the middle of the nineteenth century was responsible for the growth in size of many towns. Towns with established industries, and situated at nodal points as far as routes and railway construction were concerned, quickly took the lead and became not only the industrial but also the commercial centres of their respective areas. Leeds, at the entrance to the Aire Gap, is a noteworthy case, being highly important as a railway junction as well as for its many and diverse industries. In the United States the decline of Boston in favour of New York as a seaport may be largely attributed to the fact that the former is unfortunately placed in regard to modern railway transport by the configuration of the land behind it. New York has the advantage of the Hudson-Mohawk Gap, a most important factor in the development of the port.

In certain cases the importance of a town is due entirely to the fact that it is a railway centre, as, for example, Crewe.

ANALYSIS OF THE POSITION AND IMPORTANCE OF CERTAIN TOWNS.

THE UNITED KINGDOM.

London, both the largest town and the greatest port of the British Isles, lies at the head of the most important estuary of England, the Thames, which is almost opposite the mouths of the continental rivers, the Scheldt and the Rhine. From earliest times these two rivers have been great highroads of European commerce and civilisation, and their proximity therefore affected London's early growth. The choice of the site was due to the facts that it was at the limit of navigation, for there was a ford at Westminster, and also that it was the lowest place where firm ground was found on both sides of the marshy shores of the Thames estuary (Fig. 120). Hence the Romans built a bridge at the spot which marked the limit of sea transport, and made it of early importance as a transhipping point. The value of the site of the port was further increased by the great Roman road from Dover, which passed between the marshy shores of the Thames on the north, and the North Downs and thick Weald Forest on the south, causing all traffic from the Continent to pass through London, whence a series of roads radiated all over the more open country to the north and west.

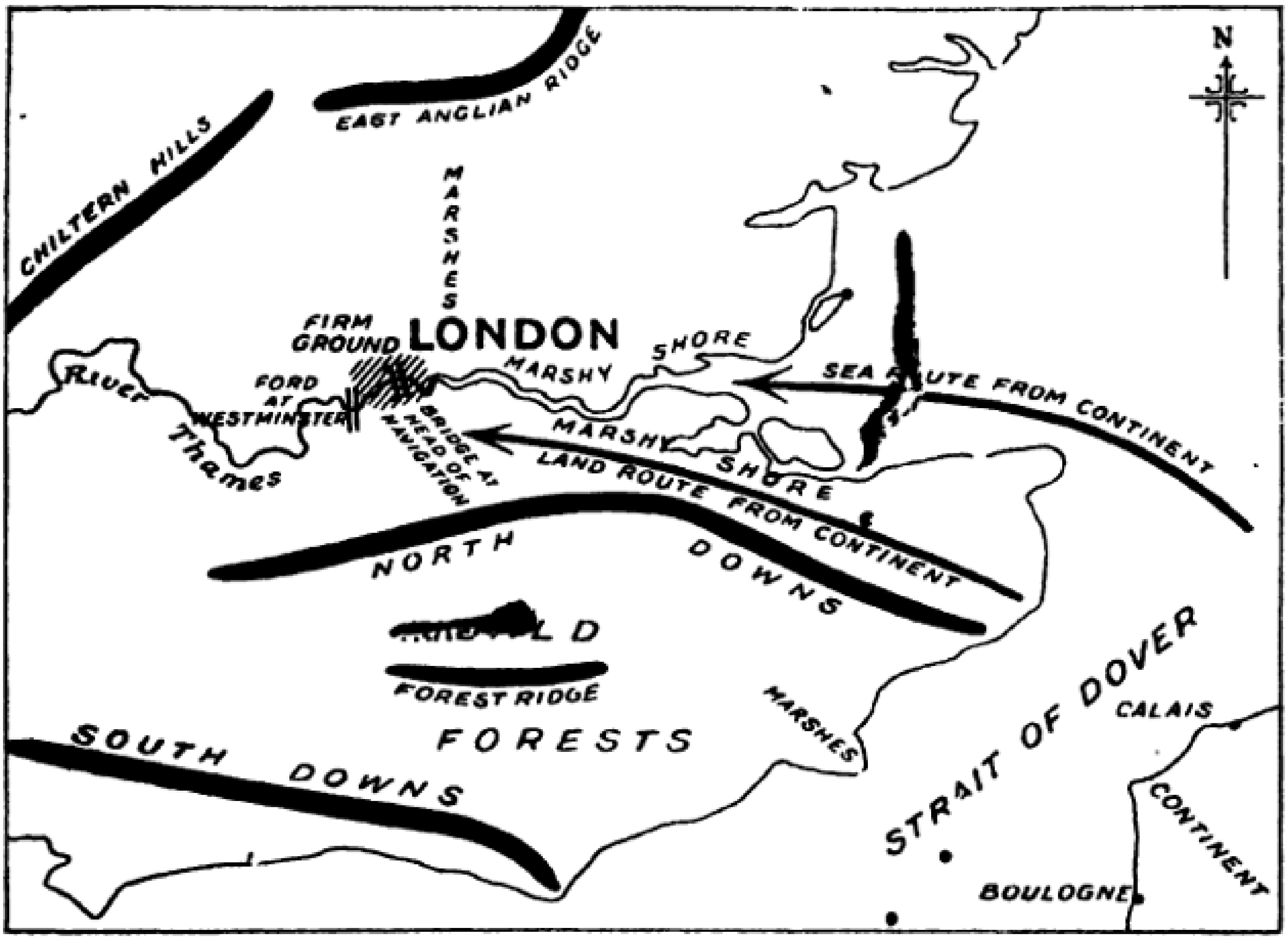


FIG. 120: THE SITE OF LONDON.

Then there were other factors. The agricultural areas were at this time the most important in the country, and London, as the centre of agricultural England, could scarcely help being in the van of progress.

It became naturally the capital of the country and the seat of the Government. As the years went on, its population and commerce increased, while it rose to be the chief railway centre of the country, as well as the headquarters for retail trade and distribution to all parts of the world.

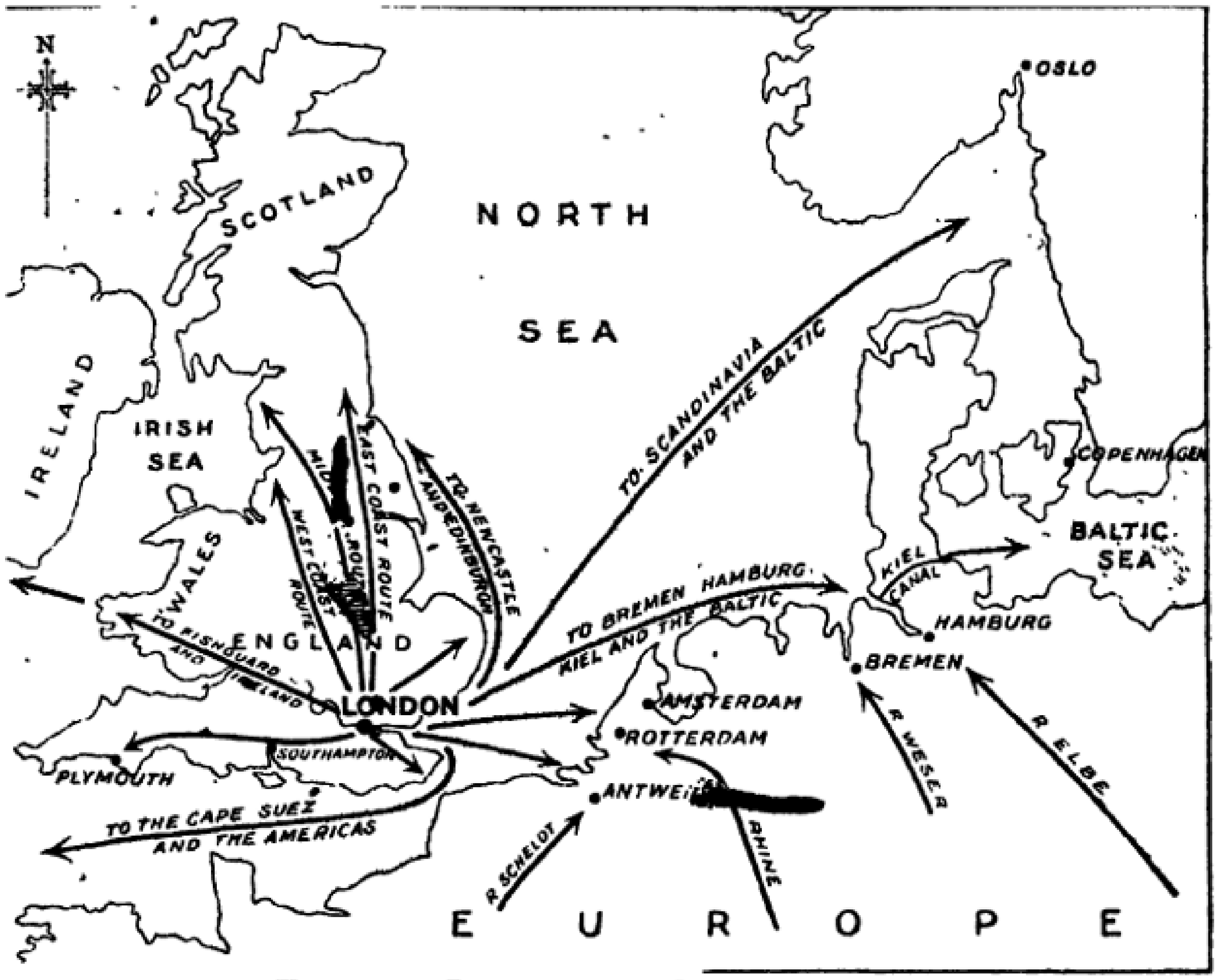


FIG. 121: LONDON AS A ROUTE CENTRE.

In all the Figs. in this Chapter, the direction of the main routes is indicated by means of arrows.

The Port of London now receives about a third of the British imports and consigns about a quarter of the total exports. As the greatest "entrepôt" (*see* Chapter 20) in the world, and the leading world market for tea, coffee and many raw materials, such as rubber and wool, London re-exports large amounts of her imports. This great world trade makes London of first importance as a commercial and financial centre. She has also innumerable manufactures, such as jam, confectionery, clothes, footwear, furniture, brewing, soap and chemicals, all mainly dependent on the demands of her immense population.

Southampton lies at the head of the deep and sheltered harbour of Southampton Water between the estuaries of the Test and the Itchen, and, like London, has been important from early times. The town has two essential advantages: its double front, due to the peninsular situation of the town between two estuaries, and its double tides, due to its receiving the same high tide *twice* daily. The tide advancing up the English Channel enters first by way of the Solent, and again, two hours later, by Spithead (*see* Fig. 122). This gives Southampton *four* high tides a day and prevents the occurrence of the normal low water minimum, with the result that ships can enter or leave the port at any time. Further, the tides are not accompanied by strong currents as they are at London, and the safe shelter of the Solent is easy to gain from the Channel both by day and by night.

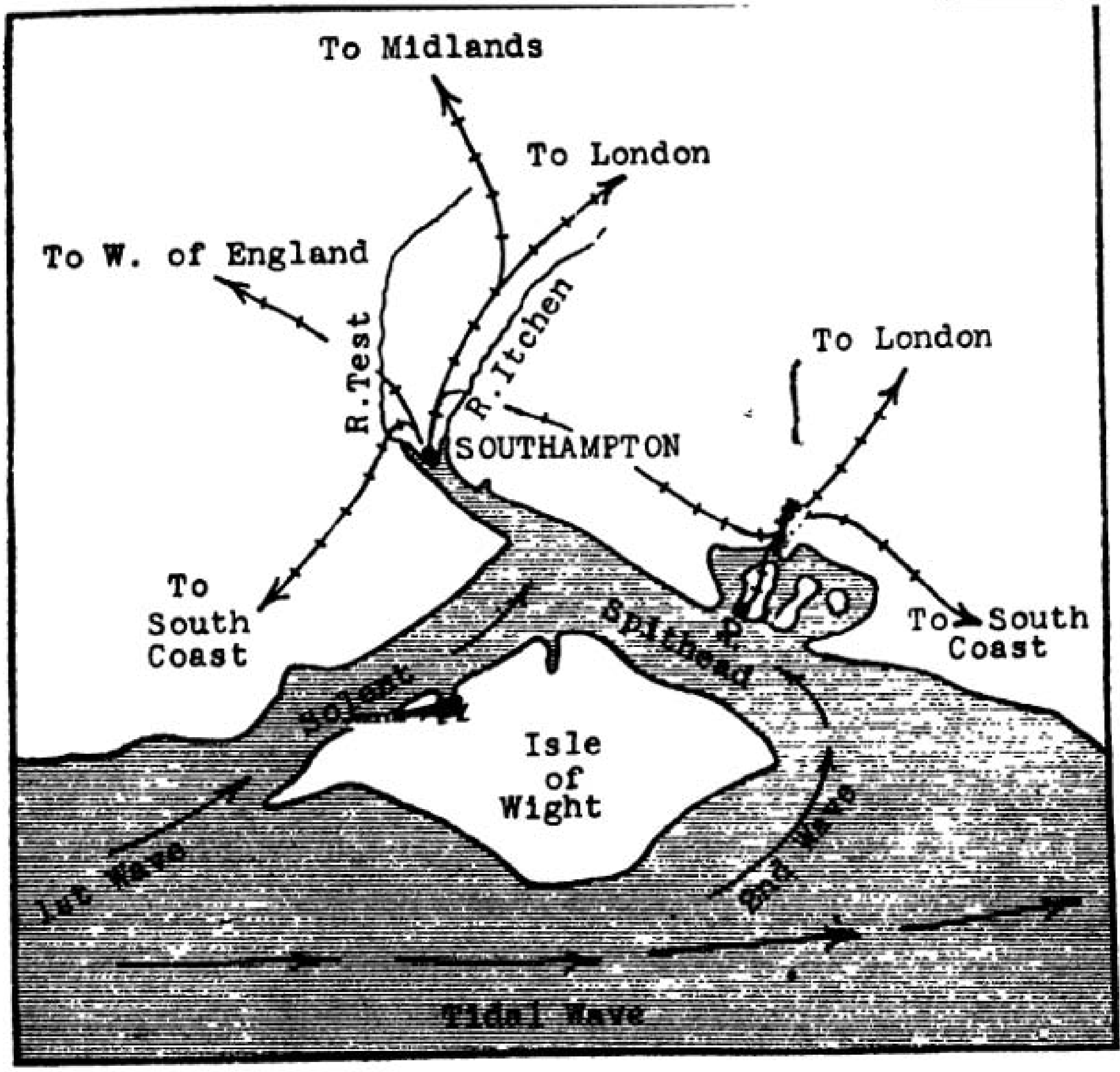


FIG. 122: THE POSITION OF SOUTHAMPTON.

All these conditions give Southampton marked advantages over London and other rival ports. Further, when cargoes have to be transhipped, it makes little difference whether they are transhipped far down the Thames or up Southampton Water, and, indeed, if Southampton is used, the long and hazardous detour *via* the foggy and congested Straits of Dover is avoided. This is an important consideration in connection with the reduction of insurance charges and speed of transport—a matter of special importance in the case of mails, meat, fruit, vegetables and dairy produce.

Southampton's important advantages have led to its rapid development as a port with first-class facilities, including the largest dry dock in the world, excellent railway connections with all parts of Britain, and a very large traffic in cargo (especially of the perishable type), in mails and in passengers. Many great shipping lines, including the Cunard and White Star (serving America) and the Union Castle (serving South Africa), now use Southampton in preference to London or Liverpool.

Liverpool received the impetus for its growth from the Lancashire cotton industry and thus developed relatively late. Such ports as Bristol, Plymouth, London and Southampton had, therefore, a great advantage over it in this respect. In the volume of its trade, however, it now ranks almost equal with London, and through it pass a quarter of the imports, more than two-fifths of the exports, and nearly a third of the entire foreign trade of the British Isles. It is the principal port in Great Britain for the Atlantic trade.

The port stands at the sea end of the Mersey estuary [*see* Figs. 116 (Chapter 14) and 123] and has a magnificent system of docks extending along the estuary for 6½ miles. With Manchester, it serves not only the great Lancashire industrial region, but also the industries of the West Riding of Yorkshire, the Potteries and the Black Country.

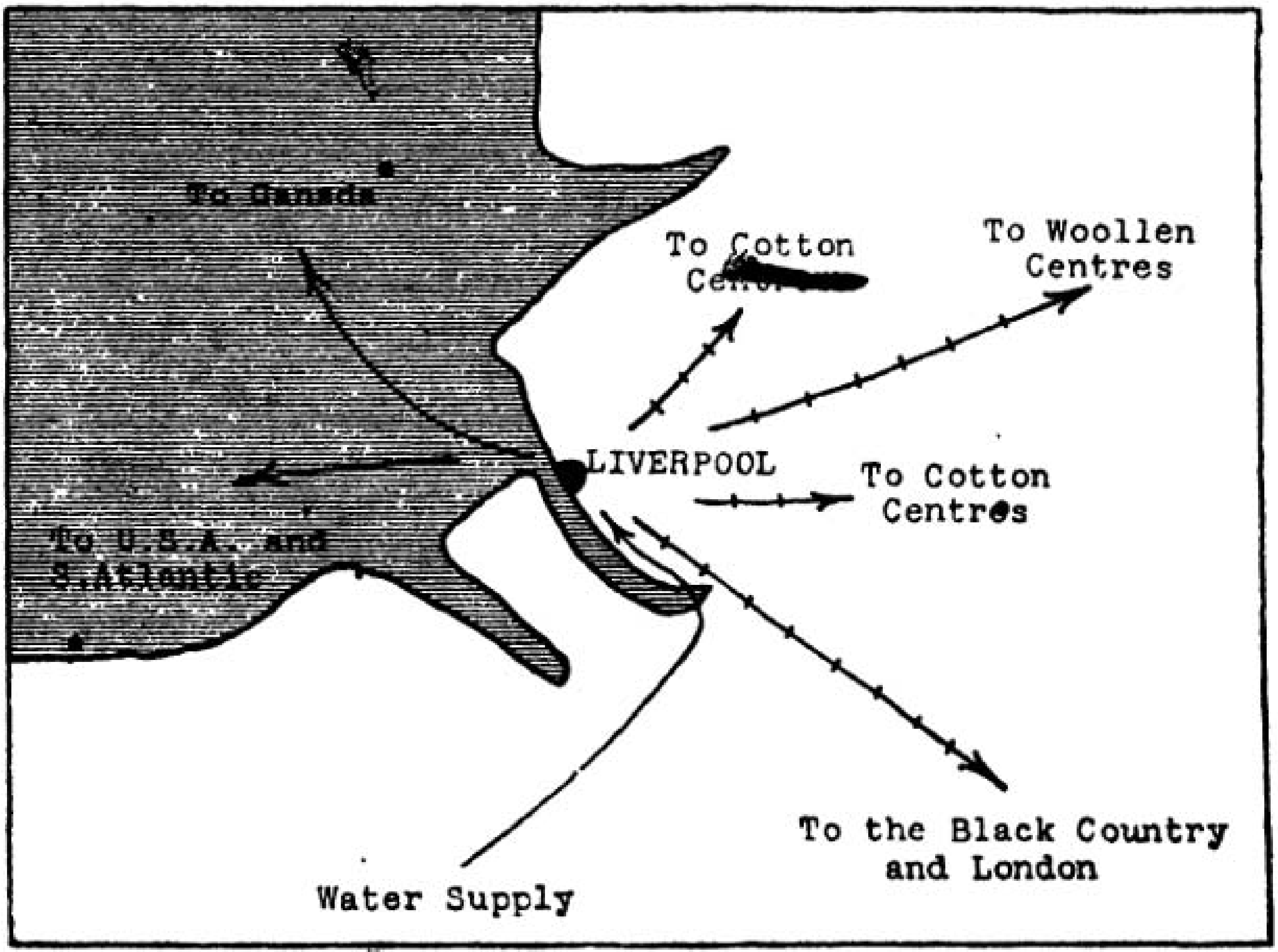


FIG. 123: THE POSITION OF LIVERPOOL.

The interests of Liverpool, unlike those of Manchester, are world wide. Manchester's one dominant interest is cotton; Liverpool, "the Home of Ship Owners", handles commodities from every part of the world and is not restricted in its interest to any one group. It is these conditions which free the port from any serious competition from Manchester. Chief among Liverpool's many imports are raw cotton, grain, meat, hides, dairy produce, rubber, palm oil and tobacco.

Its exports are chiefly cotton and woollen manufactures, metal goods and textile machinery. In addition to the trade in merchandise, regular passenger liners run from Liverpool to every important port in the world, and in normal years large numbers of tourists and emigrants pass through the port.

Glasgow, as a first-class port, is the product of the artificial deepening of the Clyde, which has enabled the largest vessels to reach the city though many of them use its outports at *Port Glasgow* and *Greenock*. Thanks to the excellent harbour facilities and to the availability of rich supplies of coal and iron ore in the surrounding region, the Clyde has become the greatest shipbuilding region in the world. There are, also, extensive industries, notably iron and steel, chemical, woollen, leather, distilling, furniture and cotton, and though any of these (even cotton, for the climate has the necessary damp quality also natural to Lancashire) could be developed extensively, this district has the greatest advantage in shipbuilding. Glasgow's most important imports are grain and flour, iron ore, fruits, bacon and hams, oils and timber. The principal exports are iron and steel goods, ships, cotton goods and yarn, linen goods, spirits, jute and woollen goods, chemicals and coal.

CONTINENTAL EUROPE

Paris, the capital of France, was originally established on the Isle of France in the Seine just below its confluence with the Marne, about 100 miles from the mouth of the river. This site facilitated

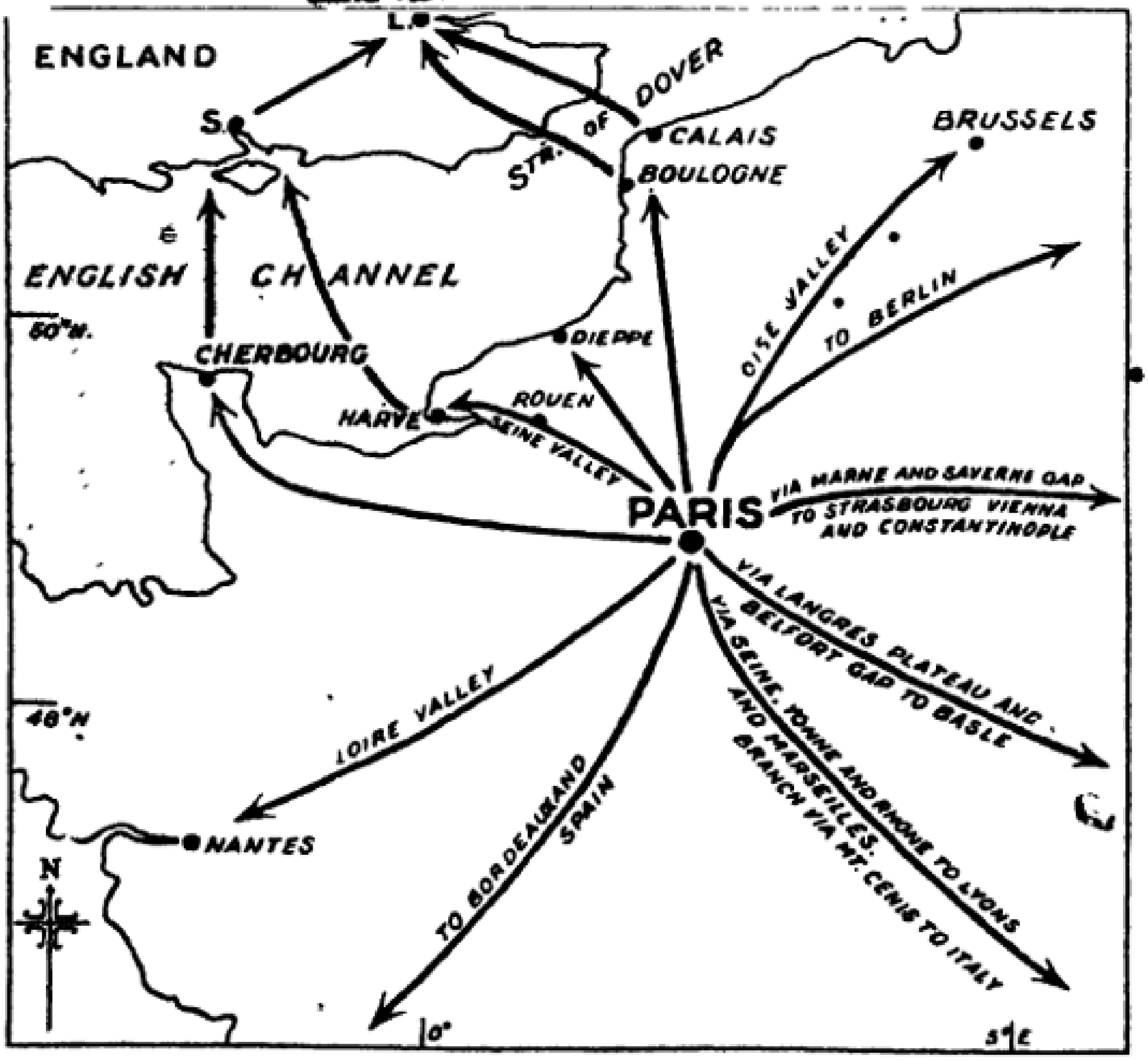

L.
ENGLAND
S.
STR. OF DOVER
CALAIS
BOULOGNE
BRUSSELS
ENGLISH CHANNEL
50°N.
CHERBOURG
DIEPPE
OISE VALLEY
TO BERLIN
HARVE
ROUEN
SEINE VALLEY
PARIS
VIA MARNE AND SAVERNE GAP TO STRASBOURG VIENNA AND CONSTANTINOPLE
VIA LANGRES PLATEAU AND BELFORT GAP TO BASLE
VIA SEINE, YONNE AND RHONE TO LYONS AND MARSEILLES. BRANCH VIA MT. CENIS TO ITALY
LOIRE VALLEY
48°N
NANTES
TO BORDEAUX AND SPAIN
N
0°
5°E

FIG. 124: PARIS—A ROUTE CENTRE.

bridging, was easily defended and was a convenient centre for the rich agricultural Paris Basin. Its position naturally made it a route centre, with roads converging on it from all directions, and with the advent of railways it became an important railway centre. In addition, the river is navigable from Paris to the sea, and, with the growth of air transport, the town is assuming great importance as a European air centre.

The natural advantages of the site on which Paris is built greatly facilitated its development, and to-day the city is next to London and New York in size and wealth, despite the fact that there are no adjacent coal and iron fields. The principal industries are those connected with fashion and the arts—the so-called "Articles-de-Paris" being known all the world over. They include gold and silver jewelry work, china (Sèvres porcelain), tapestry, gloves, women's clothes and millinery. Paris is also a great commercial and financial centre, its Bourse, or Money Market, being easily the first of those on the Continent.

Marseilles (*see* Fig. 159, Chapter 22), the principal port of France, lies in southern France to the east of the Rhône delta on the Mediterranean Sea. It owes its importance largely to the opening of the Suez Canal, and to its position at the seaward end of the Rhône-Saône "corridor" leading from northern to southern France and at the eastern end of the Carcassonne gap, which gives access to and from western France. It is also conveniently situated in relation to, and important as a port for, the French African colonies.

Marseilles has a large foreign and shipping trade, especially as a packet station for routes to the East, for it is an important port of call for vessels from Western Europe and Great Britain to the East *via* the Suez Canal. Many passengers to and from Britain and North-west Europe pick up or leave the boat at Marseilles as they prefer the quieter overland route to the longer sea passage through the Bay of Biscay. Wines and iron are imported from the African colonies, especially Algeria; silk from Japan and China; and palm-oil, copra and oil-seeds from West Africa. These imports reflect the principal manufactures, which include marine engines, chemicals, soap, sugar and silk.

Le Havre lies on the English Channel at the mouth of the Seine (Fig. 124). It is the port for Paris and is second in order of importance of all the French ports. The Seine valley gives it excellent communication inland, and, as it is connected by rail with Strasbourg on the Rhine, it acts as a transit port for much of the American trade with Germany. In addition, the port lies on the route between America and Western Europe, and is thus an important port of call. The principal imports are cotton, wheat and tobacco, while the principal exports are wines and Parisian goods. As a shipbuilding centre it is one of the greatest outside Britain.

Berlin (Fig. 125), the capital of Germany, is centrally situated on the North German Plain. It stands on the river Spree at a point where the river could be easily crossed and where an island combined with the narrowness of the river facilitated bridging. It thus early became a route centre, and is now the railway centre as well as the air centre of Germany. The city has many manufactures, including engineering, chemicals, printing and textiles.

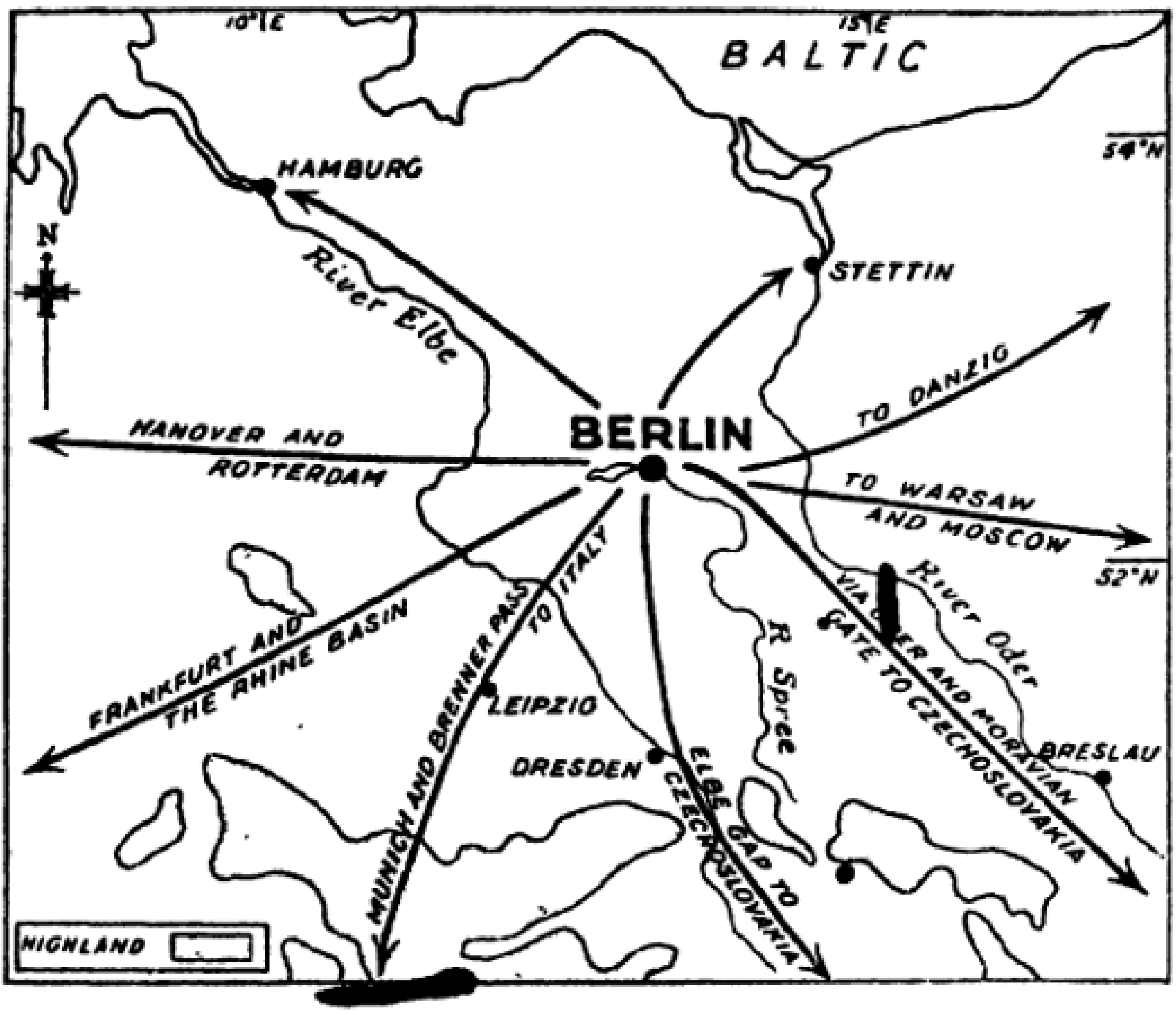


FIG. 125: BERLIN—A ROUTE CENTRE.

Hamburg, the most important port of Germany and the principal port of the Continent, grew up at the head of the Elbe estuary at a point where the first dry and firm land on the banks enabled the estuary to be conveniently bridged. It has excellent communications (Figs. 125 and 126), not only with the sea, but also inland, for in addition to the railway there are numerous navigable rivers and canals which converge on the Elbe. It thus has an extensive hinterland, and is the natural outlet for the agricultural and manufactured products of the German plain and Bohemia. In addition, it faces the seaboards of the manufacturing countries of Britain and the United States.

Hamburg is an important entrepôt for Western Europe, particularly for Scandinavia and the Baltic, and has an extensive trade in such commodities as coffee, sugar, tobacco, silk, jute, textiles, machinery, rice, coal, iron and petroleum. There are also many industries, including shipbuilding and ship-repairing, chemicals, jute manufacture, sugar-refining, engineering, wheat-milling and soap-making.

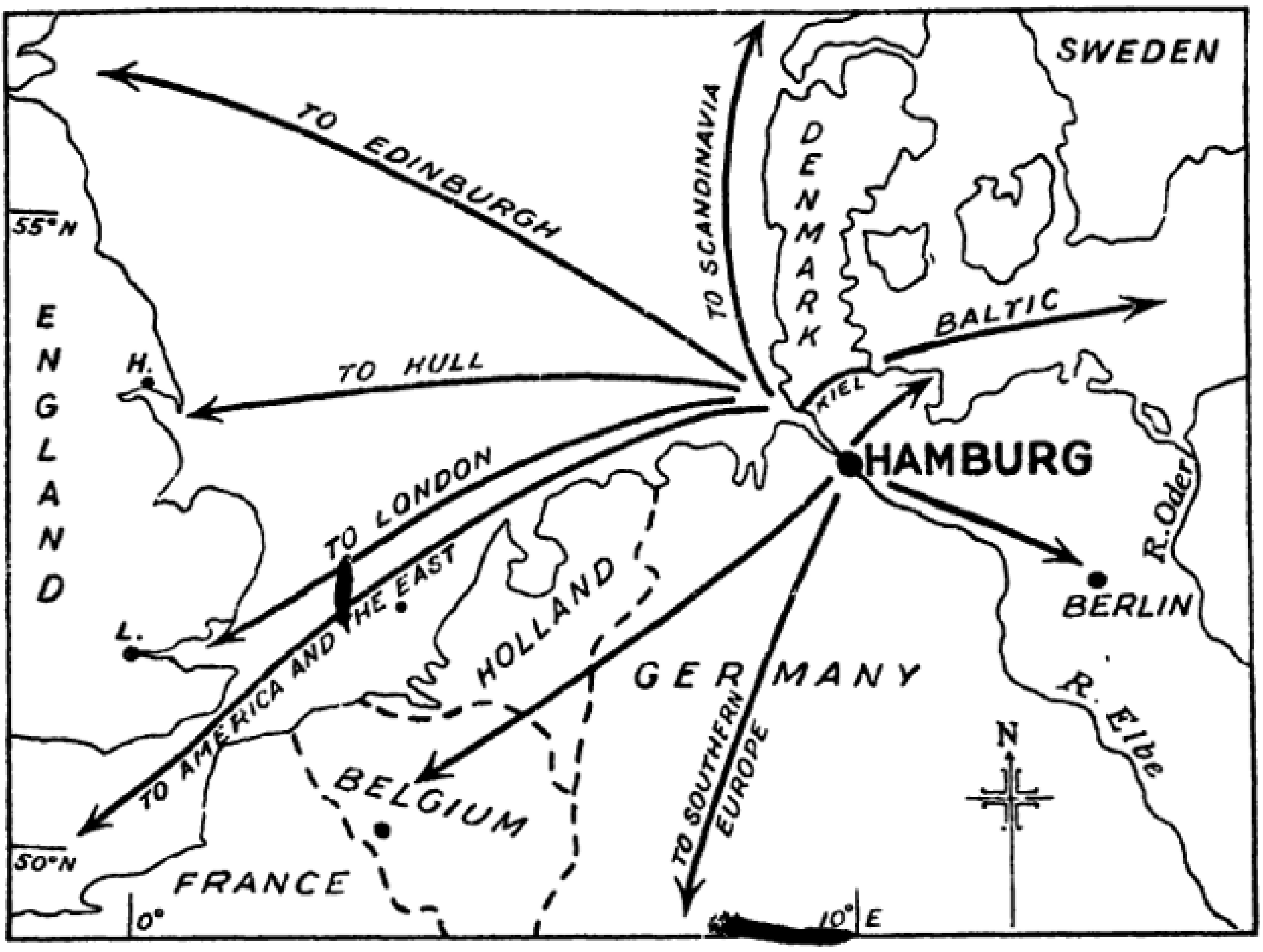


FIG. 126: HAMBURG'S "CONTINENTAL OUTLOOK".

Antwerp (Fig. 127) lies at the head of tidal navigation of the Scheldt estuary and is the principal seaport and commercial centre of Belgium. It has good communications inland, by railway as well as by canal, and has thus become important as a transit port for much of the sea-borne commerce of northern Germany. The port has numerous exports and imports, including, among the former, woollens, metals, sugar, glass, flax and iron; and, among the latter, petroleum, cotton, wheat, coffee, tobacco and wool. The principal industries are shipbuilding, textiles and the cutting of diamonds and other precious stones.

Amsterdam (Fig. 127), the largest city of the Netherlands, arose at the point where the river Amstel enters the Ij or Y, an arm of the Zuyder Zee. The city is built on numerous islands formed by the Amstel and many canals, and the buildings are largely supported on piles driven through a top surface of soft peat to a firm foundation of clay below. Amsterdam owed much of its early development to the activities of the Dutch East India Company (which widely developed Dutch trade with overseas countries), and to the opening of the North Sea Canal and the North Holland Canal. The former canal connects Amsterdam with Ijmuiden in the west and the latter with Helder in the north. The city has a large trade with the Netherlands East Indies, and is famed for its characteristic industry of diamond cutting and polishing. Other industries include sugar-refining, brewing, distilling and the manufacture of chemicals.

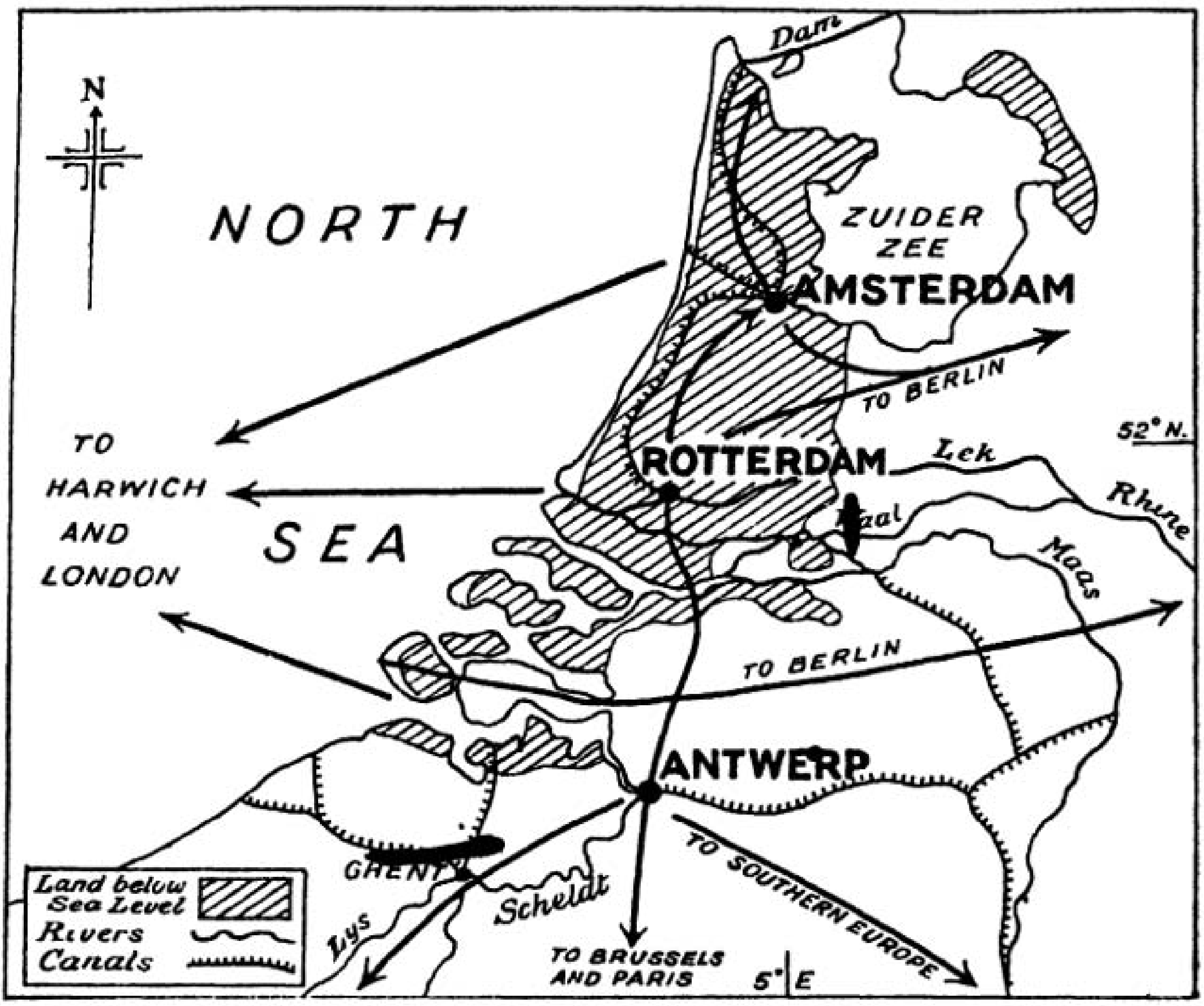


FIG. 127: ANTWERP, AMSTERDAM AND ROTTERDAM.

Rotterdam (Fig. 127) is the principal port of Holland and grew up on the Rhine delta near the mouth of the Lek, a situation which makes the port the natural outlet of the Rhine Basin. A canal known as the "New Waterway" gives it unimpeded access to the sea. Rotterdam is an important commercial port and packet station, having a large trade with Germany and the Netherlands East Indies.

Owing mainly to its heavy imports of colonial produce, imports into Rotterdam are more extensive than exports, and ships frequently sail in ballast to Britain to find outward cargoes. The principal exports are flax, linen, dairy produce, spirits and cattle. The numerous imports include sugar, rice, tobacco, indigo, metals, coal and petroleum. Shipbuilding, brewing, sugar-refining and soap-making are among the main industrial pursuits.

Oslo, the capital and principal port of Norway, is situated at the head of the Oslo fiord in the south of the country, eighty miles from the open water of the Skagerrak, and is the natural outlet of the Glommen valley, which gives it excellent communication with the interior and with the west coast (Fig. 128). The port is the principal commercial centre of the country and an important centre of the timber trade. The harbour is frozen for three or four months during the winter, but is kept open by ice-breakers.

There are numerous industries in the town, including paper and match factories, wood pulp mills, cotton and wool spinning and weaving, brewing and distilling. The principal imports are raw materials, such as coal, and manufactured goods, especially iron and steel goods and machinery. The exports include timber, wood pulp, matches, paper, dairy produce, fish and seal skins.

Stockholm (Fig. 128) lies at the Baltic entrance to Lake Malar on the east coast of Sweden, which gives it command of the eastern entrance of the lake communications of Sweden. The fact that the city is built on numerous islands has facilitated bridging and has caused Stockholm to be termed the "Venice of the North". Stockholm is the capital of Sweden and the principal commercial centre, but is second in importance to Göteborg as a port.

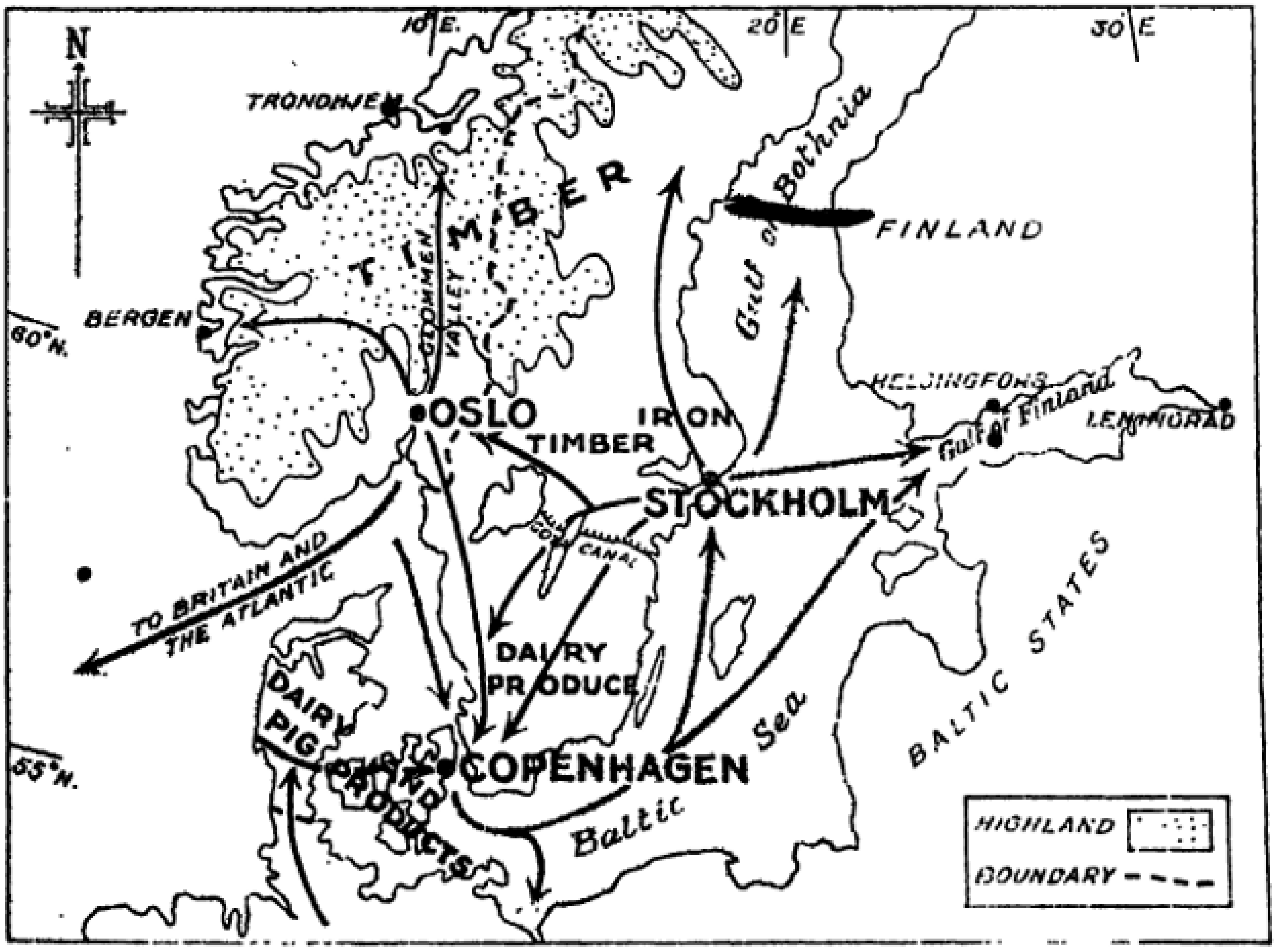


FIG. 128 : THE SITUATION OF OSLO, STOCKHOLM AND COPENHAGEN.

The principal industries are those which deal with cotton, wool, silk, linen, leather, sugar, rice and machinery. The port has an extensive shipping trade, especially in iron-ore, timber and matches, but, like Oslo, it has to be kept open by ice-breakers during the winter months.

Helsingfors, the capital and principal port of Finland, occupies a defensive position on the Gulf of Finland. It is strongly fortified, and its peninsular situation is protected by numerous islands and rocky cliffs. It has a splendid deep-water harbour, and exports timber, paper and butter. The principal imports are iron and steel goods and foodstuffs. The general situation of the port is shown on Fig. 128.

Copenhagen is the capital as well as the principal seaport and industrial centre of Denmark. It is situated on the east of the island of Zealand in a position which gives it control of the Sound and thus of the entrance to the Baltic (Fig. 128). This situation has made Copenhagen an important entrepôt for the Baltic, and it has a large trade in dairy produce, grain, meat, cattle and wool. Clay in the vicinity of the town has given rise to the manufacture of the well-known "Royal Porcelain". Other manufactures include watches and clocks, pianos, chemicals, mathematical instruments, tobacco and beer.

Danzig is situated at the mouth of the river Vistula in the Baltic. The city was formerly German, but it was made a Free City under the protection of the League of Nations, the district so constituted covering an area of nearly 750 sq. miles. Danzig is the natural outlet of the basin of the Vistula (Fig. 129), and a narrow strip of land known as the "Polish Corridor" gives Poland access to the port.

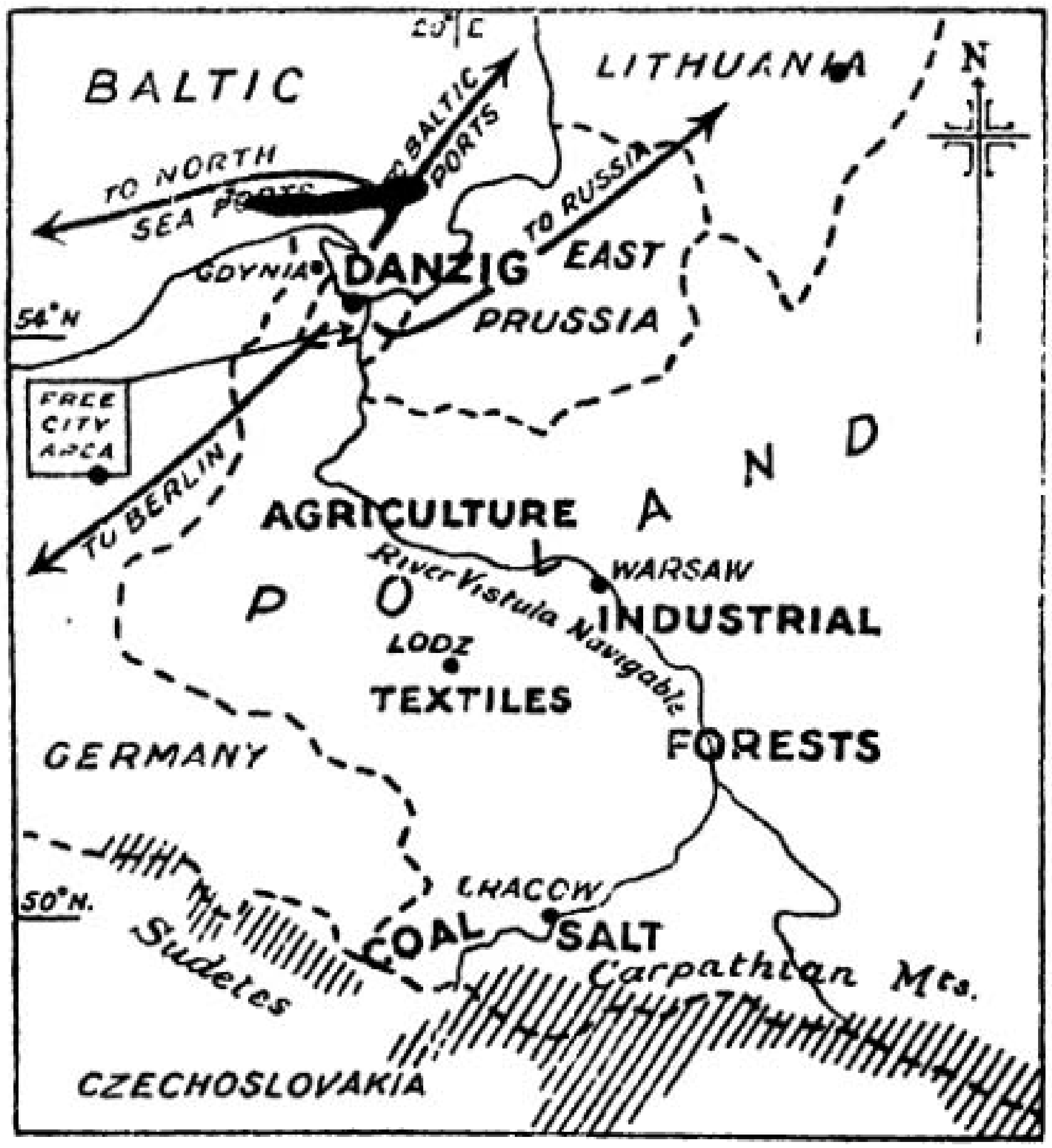


FIG. 129: DANZIG, THE OUTLET FOR THE VISTULA BASIN.

Danzig is the principal port of the eastern Baltic and the principal outlet for the lumber, grain and sugar of the European Plain, but is losing much of its trade to the new Polish port of *Gdynia,* which lies north-west of Danzig. It has also a large export of coal from the Silesian coalfield and an important shipbuilding industry. In winter the port has to be kept open by ice-breakers.

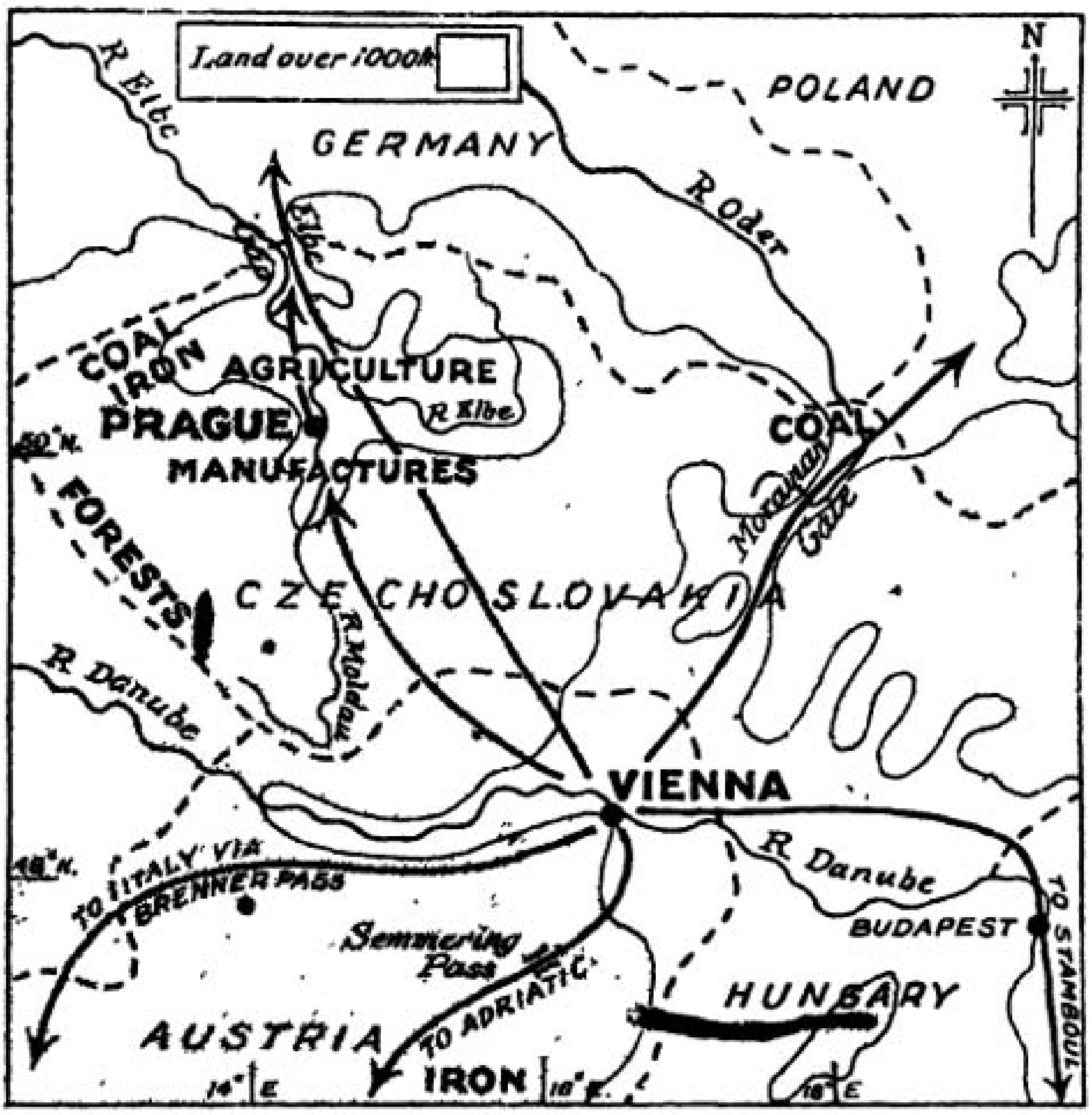


FIG. 130: PRAGUE AND VIENNA.

Prague (Fig. 130), the capital of Czechoslovakia, is at the head of navigation of the Moldau, a tributary of the Elbe. Its position gives it control of several valley routes in the centre of the Bohemian Plateau, notably the route *via* the Moldau and the Elbe to Hamburg, which is one of the principal outlets of Czechoslovakia. Prague is the centre of the industrial and most densely populated part of the country, and, as such, has important collecting and distributing activities. The supplies of sand and clay in the vicinity, together with the forests, which supply fuel, have given rise to an important glass and porcelain industry, while the presence of coal and iron has led to the growth of important iron-smelting and hardware industries. Other industries based on supplies of local raw material are the refining of beet-sugar, brewing, leath[illegible] manufacture and paper making.

Vienna, the capital of Austria, owes its importance primarily to its position. It is excellently situated on the Danube between two important iron regions and controls extensive river traffic. It is the converging point of the leading routes of central Europe, commanding the route to Russia through the Moravian Gate; the route through

Bohemia and the Elbe Gap to Germany; the route through the Brenner Pass to northern Italy, and the route *via* the Semmering Pass to the head of the Adriatic Sea (Fig. 130). It is thus an important railway centre, and is also the industrial and commercial capital of Austria, although in the latter respect it has suffered considerable decline following the great reduction in the territory of the old Austro-Hungarian Empire as a result of the Great War. Indeed, the city, in some respects unequalled in Europe, may now be said to be too large and too magnificent for the country. The principal industries include the manufacture of silks, shawls, gloves, leather goods and machinery.

Istanbul, or Stamboul (formerly called Constantinople), has a splendid position on the inlet known as the "Golden Horn" in the Bosporus—the narrow strait, leading from the Sea of Marmara to the Black Sea, which separates European from Asiatic Turkey (Fig. 131). The city has long been a "gateway" between Europe and Asia, for it stands at the place where overland routes between the two continents cross the Bosporus. Besides this, all vessels passing between the Black Sea and the Mediterranean Sea must converge at the port. It is, consequently, important for its strategic and commercial position, as a route centre and for its trade in Eastern products, chiefly carpets, scents, tobacco and leather.

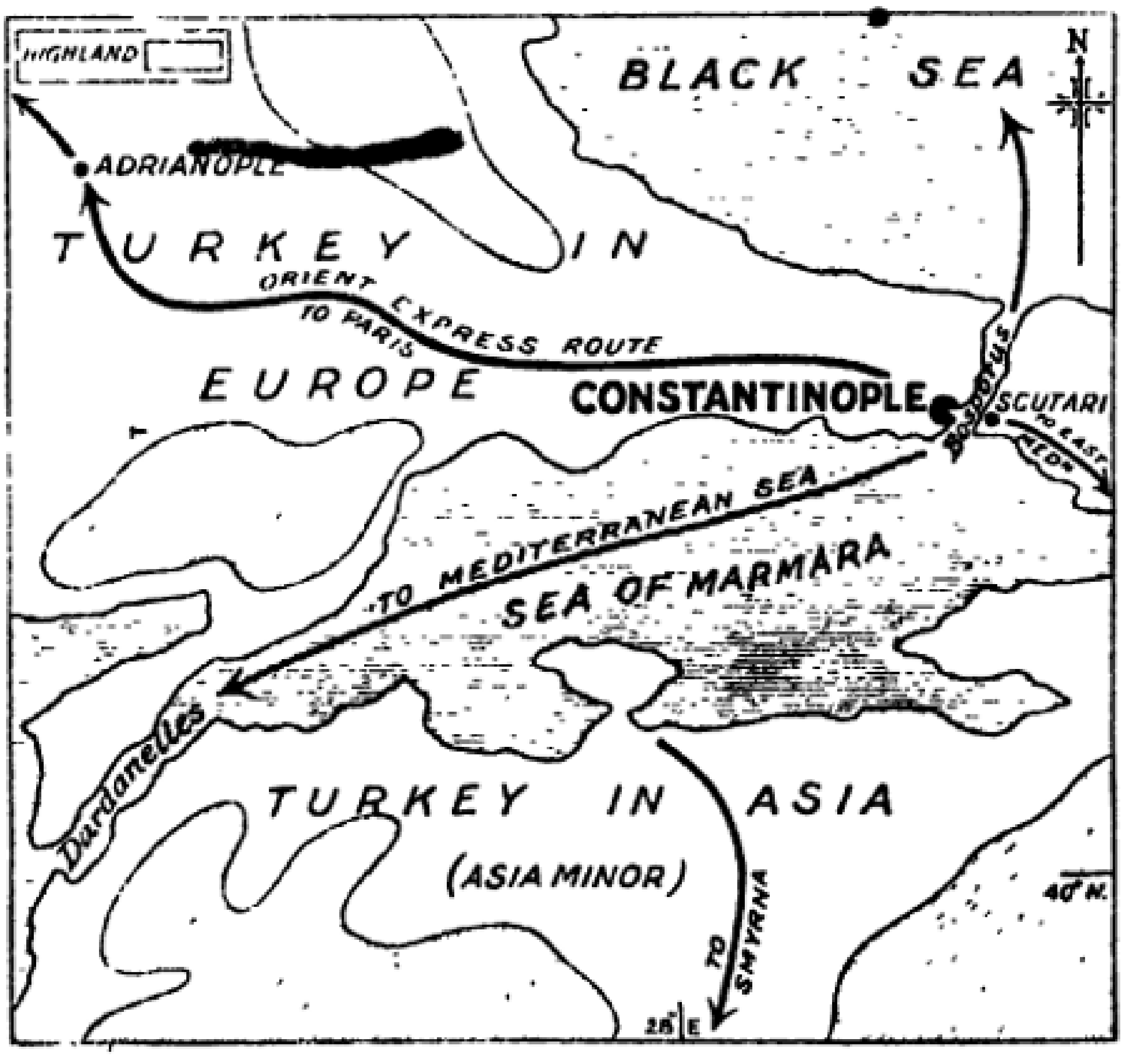


FIG. 131: THE SITUATION OF ISTANBUL (CONSTANTINOPLE).

Rome, the capital of Italy, is a route centre, but was of more importance in ancient times than it is at the present day. It originally rose at the head of navigation on the river Tiber, where there was dry land above the marshes and where an island facilitated bridging. From very early times, therefore, Rome was established as a converging point of routes. In consequence of the silting up of the Tiber, it is not now a port and the town is important to-day mainly for historical and religious reasons and as a tourist centre. It has few manufacturing industries.

Situated within the confines of Rome is the small and independent state of the *Vatican*, at the head of which is the Pope, who is the supreme and independent sovereign of the Vatican City. The Vatican City covers an area of only 108 acres, with a population of only 450 persons, but it contains some of the finest buildings and the most precious works of art in the world.

AFRICA

Cairo is the capital of Egypt and the largest town in Africa. It arose at the head or apex of the Nile delta, a position which gave it control of all the routes to and from the delta, Upper Egypt, the Isthmus of Suez, Syria and Iraq. It is thus a converging centre for rail, steamer and caravan routes, and, as the delta is very fertile, the surrounding country is densely populated. Cairo is the great commercial centre for north-west Africa and Palestine, and, owing to its dry climate, it is a favourite winter resort for Europeans. There are a few cotton mills in the town, but the manufactures generally are not important.

Alexandria, the great seaport of Egypt, was founded in 332 B.C. by Alexandria the Great, and owes its development and present

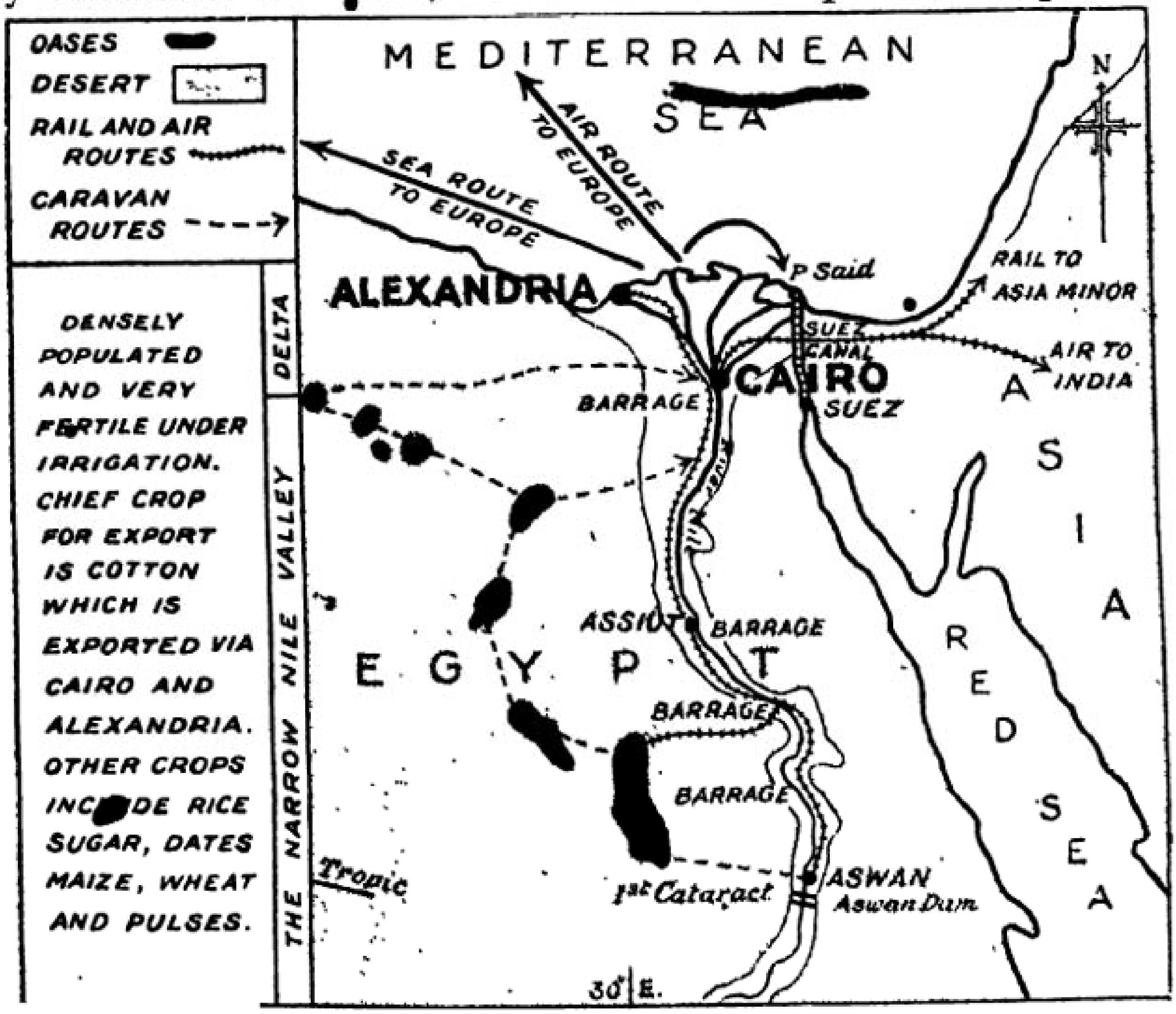


FIG. 132: CAIRO AND ALEXANDRIA, THE PORTS FOR THE NILE VALLEY.

importance to its position on a peninsula to the west of the Nile delta and to its good harbour. It has as its hinterland the whole of the Nile valley and it is the nearest Egyptian port to Europe. The port now handles nine-tenths of the export trade of Egypt, 75 per cent. of which consists of cotton exports to Europe. Other exports are cotton seed, cotton cake and onions to Britain, rice to Asia Minor and cigarettes to Europe.

Cape Town, the capital of the Cape of Good Hope Province and the legislative capital of the Union of South Africa, lies in the extreme south-west of Africa between Table Bay and the north base of Table Mountain, which affords shelter from the south-easterly winds (Fig. 133). Its harbour is not naturally a good one, but it has been artificially improved and is now of first-class importance, being connected by rail with all parts of South Africa.

Originally established as a revictualling station for the Dutch East India Company's boats plying between Holland and the East Indies, Cape Town is still of great importance as a port of call. Besides being the first port touched at by the regular liners serving South Africa, it is much used by ships rounding the Cape of Good Hope to and from Australasia or S.E. Asia, both for revictualling and bunkering. It is the chief port for the landing and embarkation of passengers and mails for the whole of the Union, and is the outlet not only for the produce of its immediate hinterland, *i.e.*, for wool, feathers, hair, fruit and wine, but also for most of the gold and diamonds from the Kimberley and Pretoria mines. In addition, it is a whaling and fishing centre.

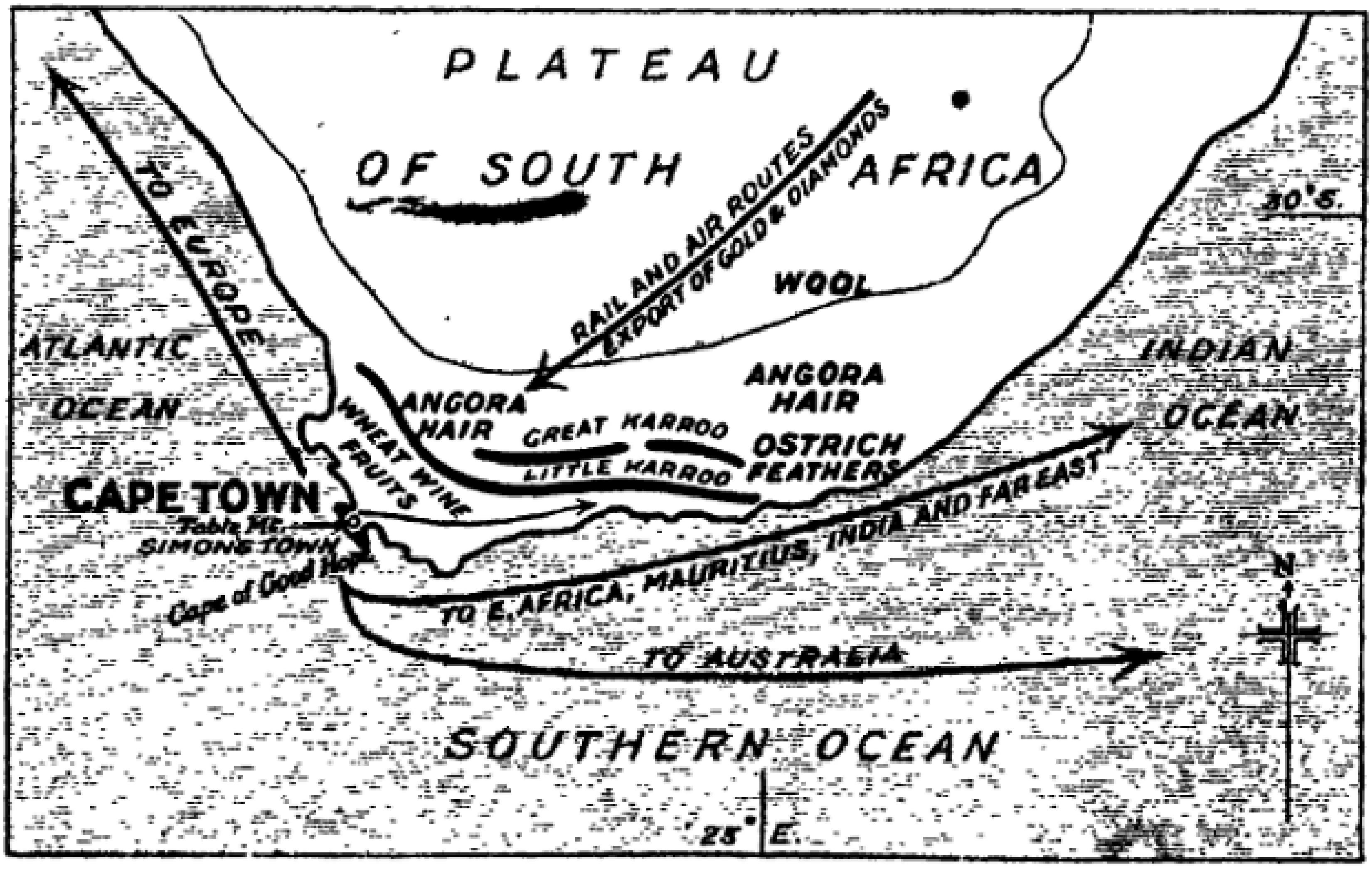


FIG. 133: THE SITUATION OF CAPE TOWN.

Simon's Town, situated on False Bay, behind Table Mountain, is important as the naval base of the British fleet in South African waters.

THE AMERICAS

Montreal is the largest town, the principal port and the chief commercial centre of the Dominion of Canada. It is situated in Quebec on the river St. Lawrence where an island facilitated the bridging of the river, and it has a magnificent position commanding the converging point of many important routes (Fig. 134). The deepening of the channel of the river has placed it at the head of ocean navigation for large vessels; it commands the traffic to and from the Great Lakes, most of the cargoes having to be transhipped there; it commands the routes of the Ottawa valley, by both rail and river; while the routes from New York and other American Atlantic ports converge on it through the Lake Champlain gap. These advantages are sufficient to counteract the disadvantage which arises through the closing of the port by ice during the winter months. The city is naturally a great railway junction, and it contains the headquarters not only of the Canadian Pacific and the Canadian National Railways, but also the offices of several important trans-Atlantic shipping companies.

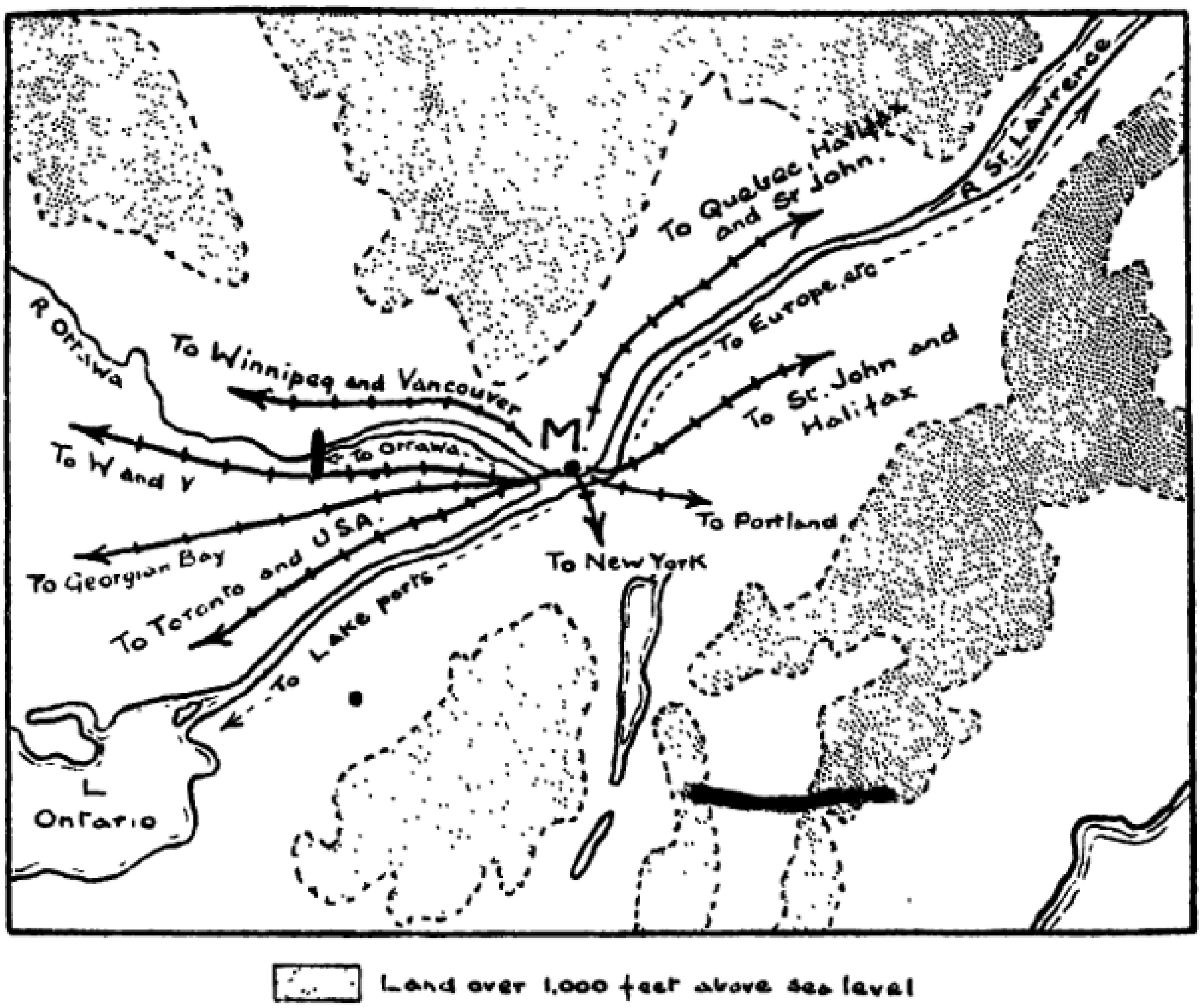


FIG. 134: THE POSITION OF MONTREAL.*

The Lachine Rapids, on the St. Lawrence above Montreal, and the Shawinigan Falls, on the St. Maurice River, provide ample supplies of cheap power, and have enabled the town to develop as a great manufacturing centre, with important industries employing many thousands of workpeople. The manufacture of railway plant and sugar refining are the chief industries, but manufactures of leather and leather goods, textiles, india-rubber, tobacco and malt liquors are also important. The city has huge elevators for storing and transhipping grain, and is the world's seventh port in order of importance.

Winnipeg, the capital of Manitoba, is situated at the confluence of the Assiniboine and Red rivers. Its position in the narrow passage (about 80 miles wide) between Lakes Winnipeg and Manitoba and the United States frontier, "the bottle-neck of Canada," has made it a very important railway junction (Fig. 135). All the east-west lines converge upon the town, and there are important lines serving the districts to the north and the south. Thanks to this, Winnipeg has become the great commercial centre for central Canada and the greatest grain market of the whole of the British Empire. The town has many grain elevators and a great flour-milling industry. Other industries include saw-milling, meat-packing and the manufacture of leather, farm implements, wire-fencing and railway iron-work. Power is obtained from Lake Winnipeg (170,000 h.p.) and coal from the United States is imported *via* the Great Lakes.

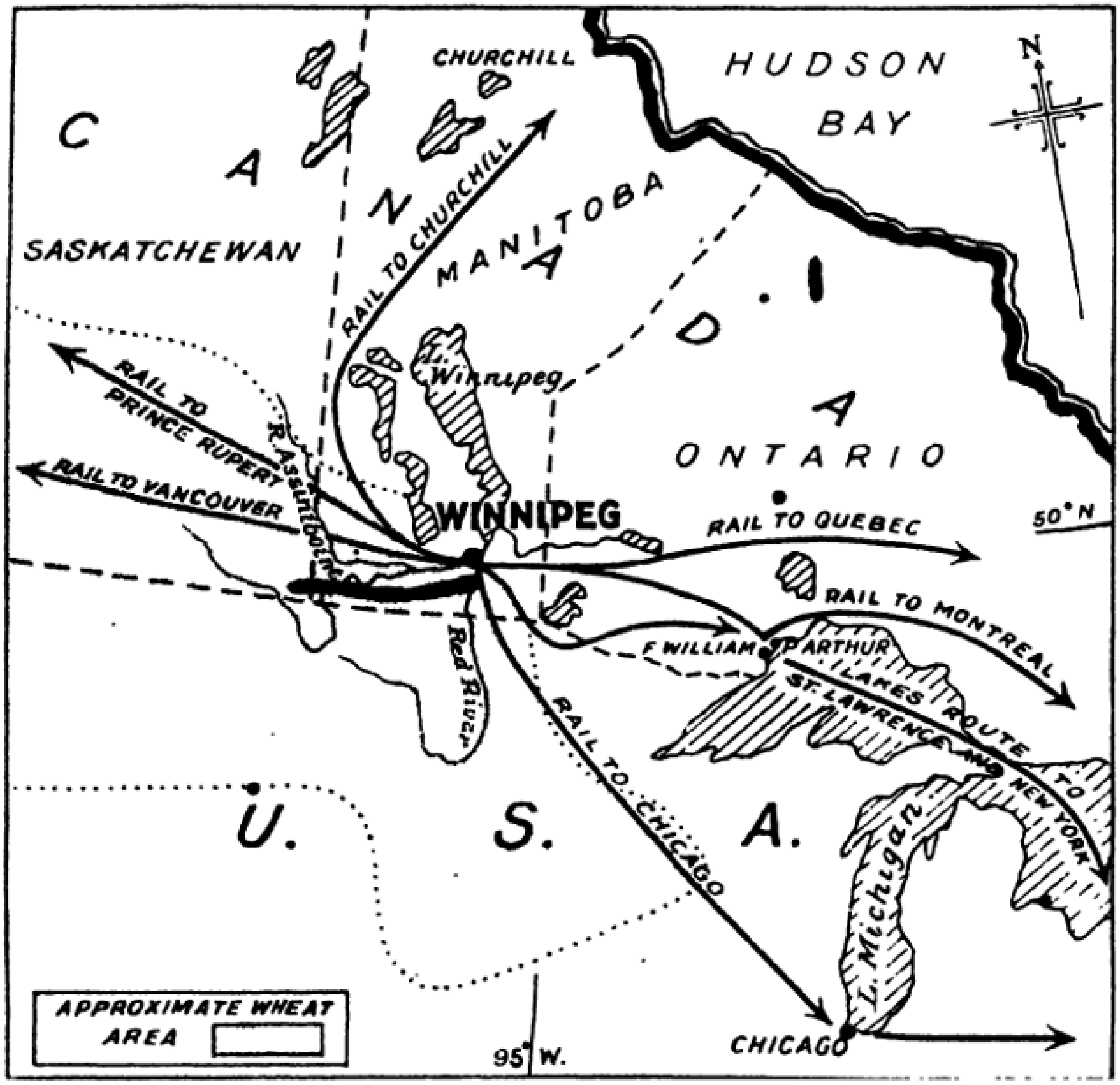


FIG. 135: THE POSITION OF WINNIPEG.

Vancouver, situated in British Columbia on a peninsula between Burrard Inlet and the mouth of the Fraser River, with a magnificent harbour well sheltered from the Pacific Ocean by Vancouver Island, has become the greatest port of the Pacific coast of all the Americas

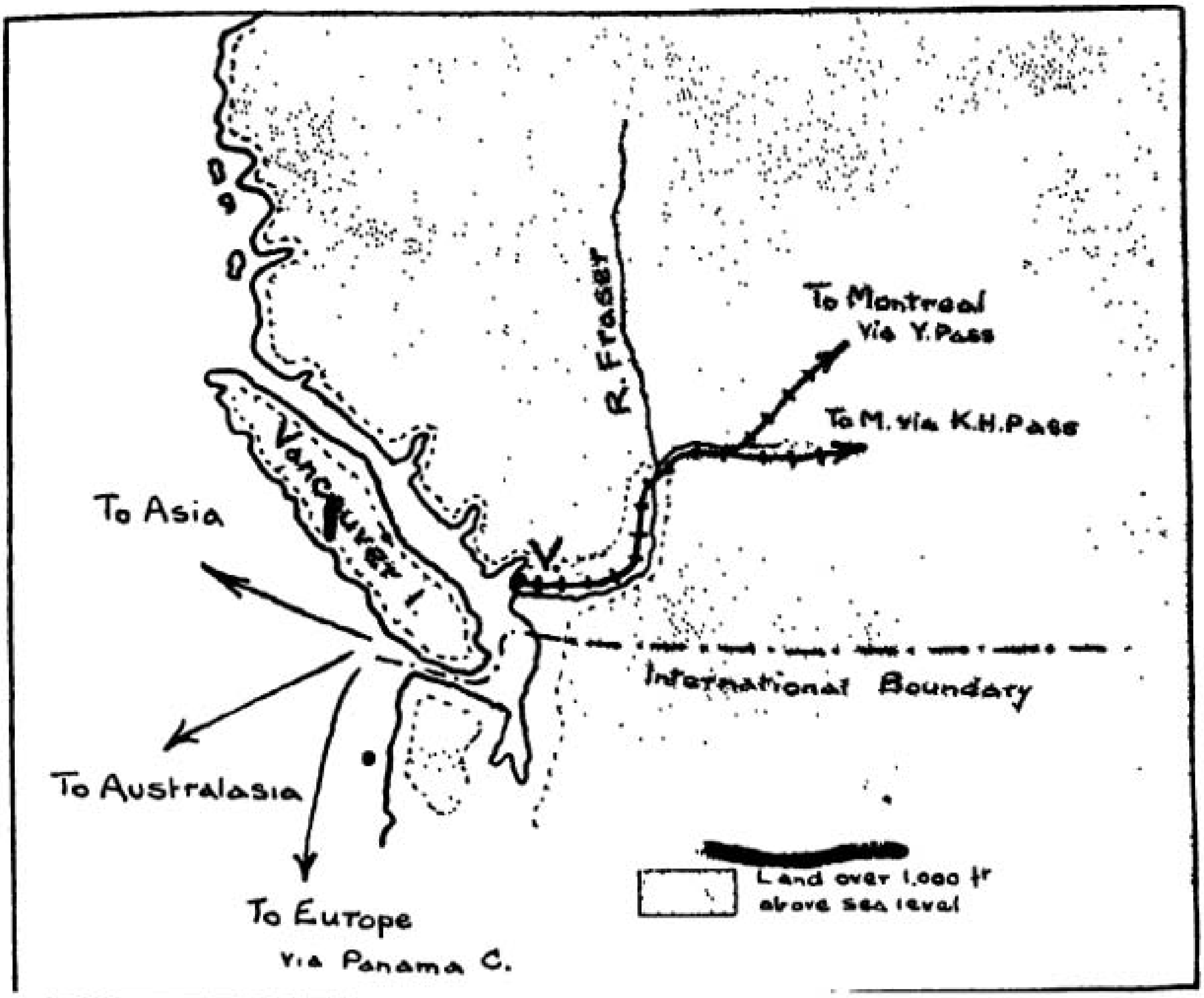


FIG. 136: THE POSITION OF VANCOUVER.

(Fig. 136). It is the nearest shipping point to the great grain-producing region of the western prairies, the export point for the greatest timber reserves in the world, and the natural gateway for Canada's trade with the Orient and Australasia.

It is served by the two great Canadian transcontinental railways and by several American roads reaching it from the south, and, in company with the other British Columbian ports, it is open at all seasons of the year. Though already of great importance, it must inevitably develop with the development of Canada as a whole.

Since the War there has been a great and steady increase in the growth of sea-borne commerce through Vancouver, particularly in connection with lumber products and grain. The opening of the Panama Canal gave the port greatly improved access to the Atlantic, and many British Columbian products are now sent by sea instead of by land to Europe and the Atlantic ports of Canada and the United States, since ocean freights, even allowing for Canal dues, are much cheaper than railway or road rates across the continent. The export of grain to Europe by this route has reached large dimensions.

The town has many important industries, including lumbering, shipbuilding, sugar-refining, flour-milling, pulp and paper manufacturing and the manufacture of textiles and food products.

New York originally arose on Manhattan Island at the mouth of the Hudson River on the east coast of the United States. Its deep, sheltered harbour, its nearness to Europe and its commanding position at the seaward end of important routes, established it as the most important port and the most densely populated city of the Americas. The Hudson-Mohawk valleys provide an easy route inland through the only complete gap across the Appalachians, while the Hudson-Lake Champlain valleys give access to the St. Lawrence and to Montreal (Fig. 137). These valleys are naturally utilised by roads, canals and railways, with the result that New York is the converging point of many important routes from inland towns to the sea.

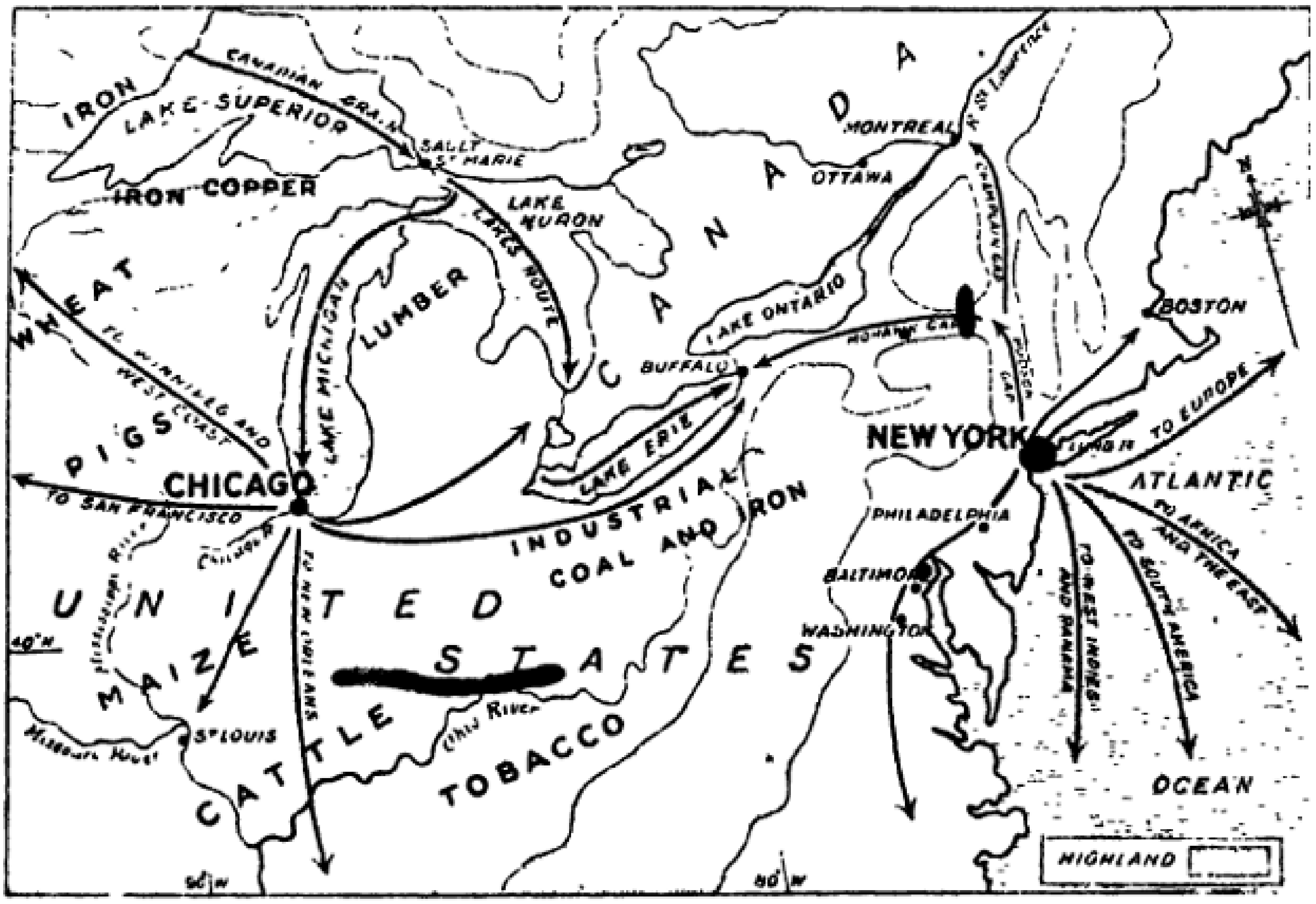


FIG. 137 : THE SITES OF NEW YORK AND OF CHICAGO.

The port is the natural outlet for the rich coalfields of Pennsylvania, for all kinds of manufactured goods from neighbouring cities and for general produce from the interior. It has numerous imports, consisting mainly of food supplies and raw materials for manufacture. New York is also important as a manufacturing centre, the principal industries being the manufacture of clothing and, owing to the presence of coal and iron, the manufacture of iron goods of great variety. Its other manufactures resemble those of London.

Chicago arose at the southern end of Lake Michigan (U.S.A.) at the point where the small Chicago River enters the Lake (Fig. 137).

It stands where the great grain and livestock regions meet the Lake navigation, at a point where all routes from the east, north of Chesapeake Bay, must meet in order to round Lake Michigan at its southern extremity, and in such a position that it has command of the routes of the Mississippi basin. Thanks to these factors it has risen to a position of world-wide importance. It is a most important railway, grain, livestock and meat centre, and is the world's most important centre for the slaughtering and canning of meat. It has also a large iron and steel industry, specialising in agricultural implements, rolling stock and machinery. The necessary coal is near at hand, iron ore is brought by water from the Lake Superior region while the vast prairies of the United States and Canada afford an almost limitless market. The port is naturally a poor one, but has been improved by artificial means.

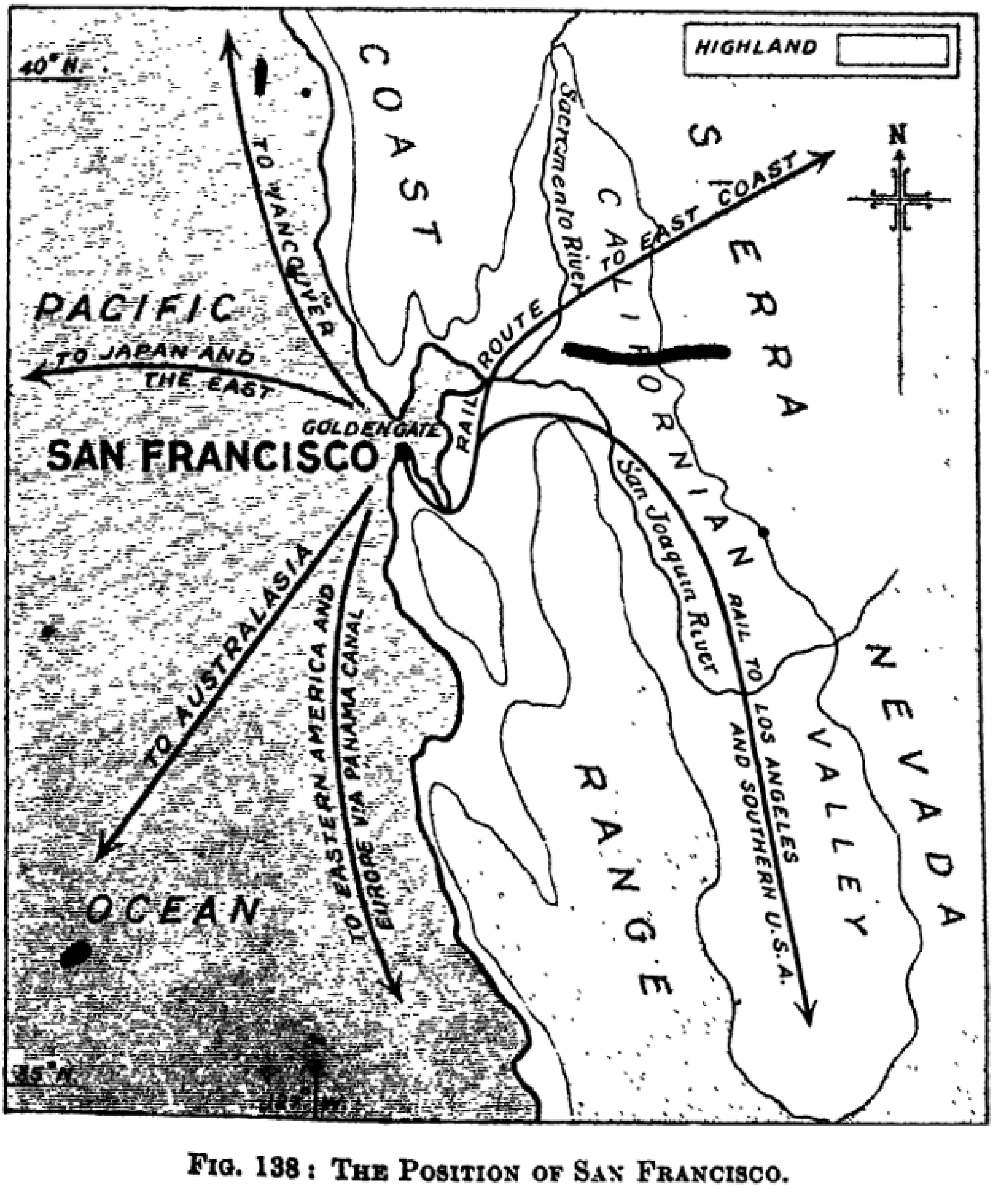


FIG. 138: THE POSITION OF SAN FRANCISCO.

San Francisco is situated on the Pacific coast of the United States on the only natural harbour between Vancouver and Mexico. Its importance was greatly increased by the opening of the Panama Canal, which gave it increased facilities for trade with the ports on the Atlantic coast of America. It is the converging point of the transcontinental routes from the east and of the coastal routes from north and south, while it has obvious natural advantages for trade with eastern countries such as Japan, China, Australia and New Zealand.

San Francisco has a particularly rich hinterland, including the Mediterranean region of the California Valley, and, although coal is lacking, there is an abundance of petroleum in the vicinity. The principal exports are gold, wheat, fruit, timber, metals and oil. The imports comprise produce from Eastern countries and Australasia, together with manufactured goods from the eastern seaboard of the United States. There are numerous industries in the town, including shipbuilding, sugar-refining, foundry works, woollen mills, cordage mills and the working of timber.

Buenos Aires (*see* Fig. 193 in Chapter 30), the capital of Argentina (South America) and the largest city south of the Equator, is situated on the La Plata estuary in a position which gives it command of the pampas and of railway routes. The city is the starting point of the transcontinental line to Valparaiso, *via* the high Uspallata Pass across the Andes, and i[redacted]entre from which railways radiate to all parts of the country. The harbour is naturally poor, being very shallow, but has now been made available for the largest vessels.

The industries include brewing, flour-milling and sugar refining, together with the manufacture of textiles, clothing, leather goods and tobacco. The exports reflect the products of the Argentine Republic, including meat and meat extracts, dairy produce, wool, hides, leather, grain, linseed and quebracho (for tanning). The principal imports are textiles, oils and iron and steel goods.

ASIA

Calcutta (*see* Fig. 139 below and Fig. 179 in Chapter 26) is situated in India about 80 miles from the sea, on the Hooghly, the chief arm of the Ganges delta. It has a poor harbour, for large quantities of silt are brought down by the river, and the port is kept open only by constant dredging; moreover, the Hooghly has a dangerous bore and is difficult to navigate. The port has great advantages, however, in comparison with which these disadvantages are of little consequence. It has a large, densely populated and very productive hinterland, with which it has excellent communications by rail, road, river, air and canal; it has practically a monopoly of the Eastern trade in jute and tea; and there are plentiful supplies of coal for shipping.

Bombay (*see* Figs. 139 and 177), "the western gateway to India", has by far the finest harbour of the country; indeed, it has one of the finest natural shelters in the world. The town is situated on the west coast of India on a small island 11 miles long by 3 miles broad so that its development and extension have been to some extent restricted, although the many causeways and breakwaters connecting the town with the mainland make its situation peninsular rather than insular.

The island and the breakwaters protect the harbour from the south-west monsoon in summer, and in winter, when the winds are blowing from the north-east, the Western Ghats have a similar effect, with the result that the harbour is made safe for large ocean-going vessels at all seasons and in all weathers. Bombay has, therefore, a big advantage over Calcutta as far as its harbour is concerned. But it has not the natural advantages possessed by that port in other ways, and its great modern importance is largely the result of railway development.

The hinterland of the port was at one time restricted by the Western Ghats to the narrow coastal plain, but the construction of the lines of the Great Indian Peninsula Railway (serving the Deccan and joining up with the eastern railway systems), and of the Bombay, Baroda and Central Indian Railway (connecting with the railways in the north) has brought within Bombay's hinterland the great cotton-growing black soil region and the fertile upper Ganges valley, thus making it the first *cotton* port of India. The Thalghat and [redacted]asses were of great importance in this railway development.

The opening of the Suez Canal, in 1869, gave the port an immense advantage by bringing it about 2,000 miles nearer to Europe, and it has since greatly increased in importance. Bombay, alone of the Indian ports, has extensive docks. It is the greatest industrial centre of the country, with a large export of cotton goods from its factories, and it seems probable that it will one day rank as the first port of India.

Karachi (*see* Figs. 139 and 179), situated on a small bay to the west of the mouths of the Indus in north-west India, has a fine natural harbour which is constantly being improved to keep pace with the development of the port, and is even less affected by the South-West Monsoon than is Bombay. Its hinterland extends from eastern Persia to the western districts of the United Provinces and includes the fertile Punjab, with which it is connected by the North-Western Railway. Karachi is at present the first wheat port and the second cotton port of India, and the great irrigation schemes which have been carried out on the Indus and the Sutlej will naturally greatly increase its importance. The town is the entrepôt for the produce of the Punjab, Sind, Afghanistan and Baluchistan, as well as for large tracts of Rajputana and even portions of the United Provinces. It is in regular communciation with Europe by air and may well become in the future the great air-port of India.

Rangoon (*see* Fig. 179 in Chapter 26), the chief port of Burma. is situated on the Rangoon River, an arm of the Irawadi delta, which, however, has connection with the Irawadi only during the wet season.

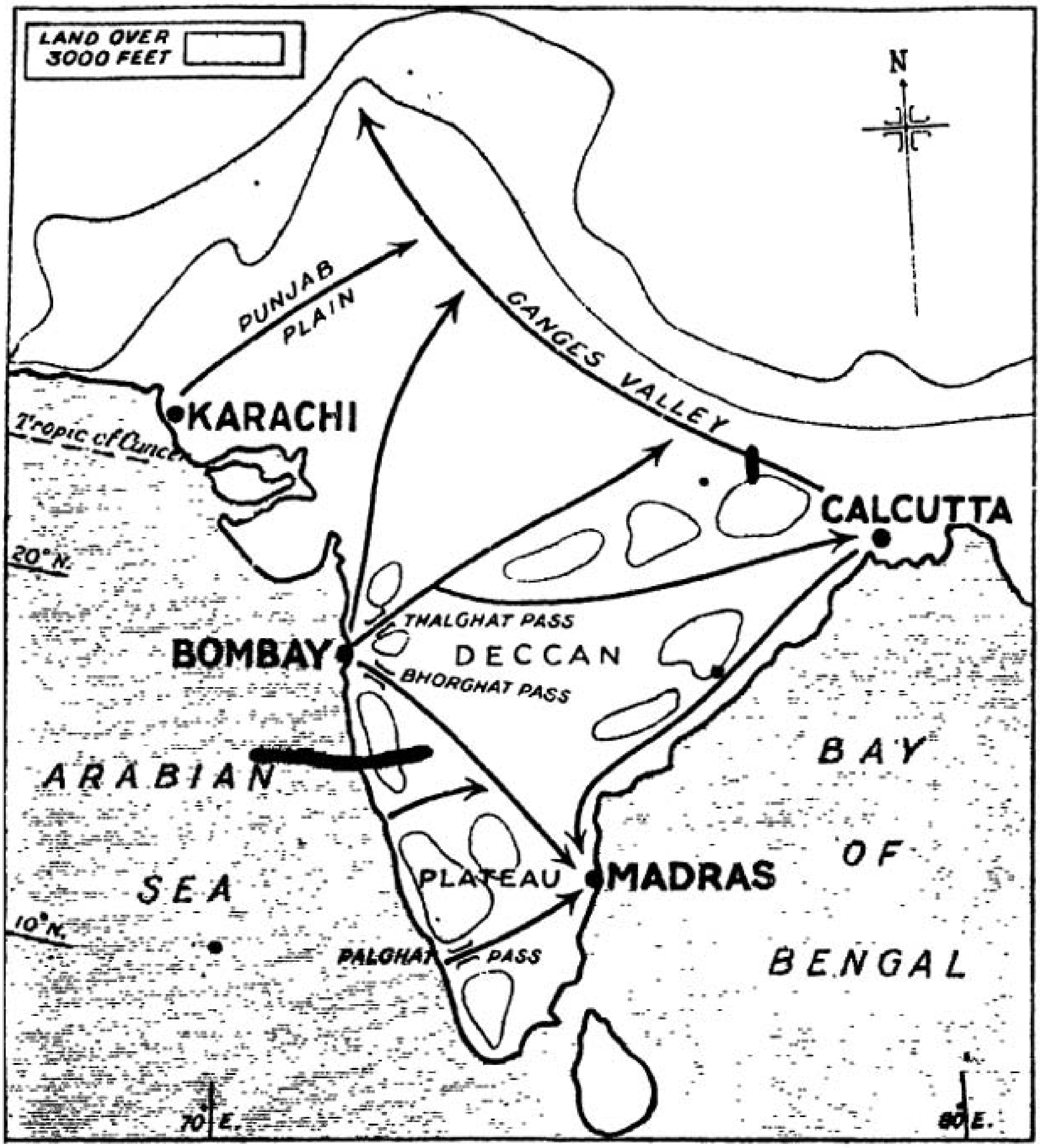


FIG. 139: CHIEF PORTS OF INDIA AND MAIN RAILWAY CONNECTIONS.

It has rail connection with Prome in Lower Burma, Mandalay in Upper Burma and Myitkyina in the north, whilst it is connected by air with Europe and south-eastern Asia. Rangoon is the chief Indian port handling rice and teak, and is important, also, in connection with the export of tin ore and petroleum.

Madras (*see* Figs. 139 and 179), on the south-east coast of India, is greatly handicapped as a port by its having no natural harbour. It offers but poor accommodation for large vessels, and the harbourage is actually dangerous during part of the North-East Monsoon. The port lies, however, at the eastern end of the railway line from Calicut *via* the Palghat Gap and has a densely peopled and very productive hinterland. Hides and skins, raw cotton and Indian piece-goods are among its chief exports.

Colombo, the capital of Ceylon, is situated on the south-west coast of the island near the mouth of the River Kelani. It has been provided with a magnificent artificial harbour and is the port through which almost all the trade of Ceylon now passes. It is also the focus of the Ceylon railway system. The importance of this port is very much more than local, however, for its central position has given it a great entrepôt trade. It is the great port of call of the Indian Ocean, and routes converge on it from South Africa, East Africa, Aden, India, the Straits Settlements, the Netherlands East Indies and Western Australia (*see* Fig. 140). These factors, too, have led to its development as a fortified coaling and oil-fuelling station, with large engineering works capable of carrying out ship repairs. It has also factories engaged in the manufacture and repair of agricultural machinery and implements, as well as large lead-rolling mills which produce the lead lining of tea chests.

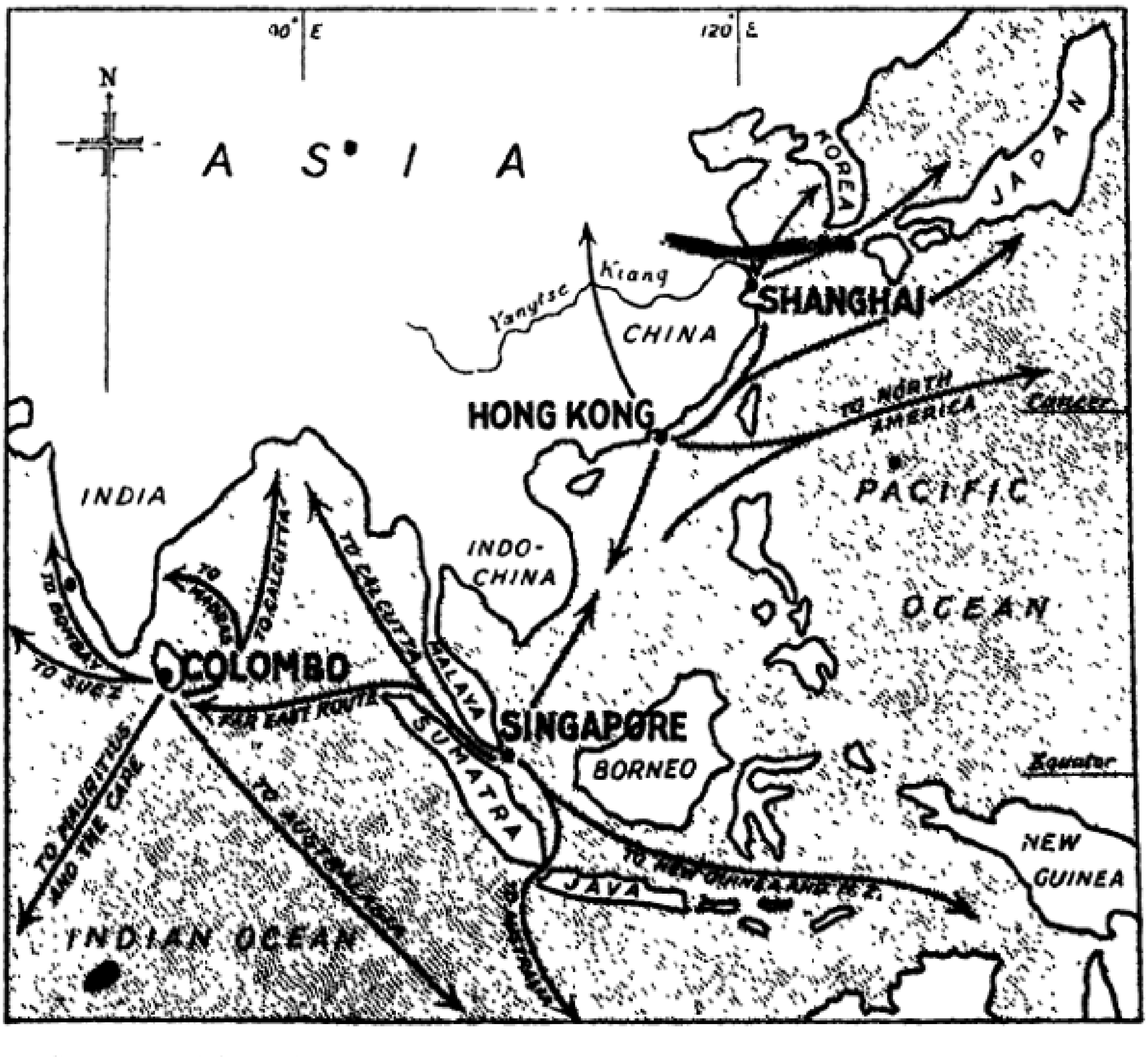


FIG. 140: THE OCEAN ROUTES CONVERGING ON COLOMBO, SINGAPORE, HONG KONG AND SHANGHAI.

Singapore is situated on the island of Singapore, which lies at the southern extremity of the Malay Peninsula, and is separated from

Sumatra by the narrow Strait of Malacca. It is the capital of the Straits Settlements and by far the most important commercial centre and port of the peninsula, whilst it is an important station on the Imperial air route to the East. The port is " free ", its harbour spacious and safe, and its position at the junction-point of all routes connecting the Indian Ocean with the China Sea (Fig. 140) has given it an immense commercial and political importance. Singapore has naturally become a great entrepôt and the leading collecting and distributing centre for the whole of the Malay Archipelago, as well as, though to a less extent, for Lower Burma, Siam and Indo-China. The principal industries are the canning of pineapples and tin smelting.

Hong Kong (Fig. 140) is the name of a British Crown Colony situated on the coast of China. The chief city of the Colony is *Victoria*, known simply as " the City " locally, but more generally as " Hong Kong ". The port is situated near the western end of the northern shore of Hong Kong island. Its harbour, formed by the strait which separates the island from Kowloon on the mainland, is one of the finest in the world, and as the port, like Singapore, is free and subject to no artificial restrictions, except as regards the importation of intoxicating liquor and tobacco, it has developed an enormous collecting and distributing trade. It serves as an entrepôt for the products of Eastern countries for export to European and other markets, and for manufactures and other goods forwarded for distribution to the countries of the East. The [redacted] typhoons is a serious drawback.

Of the wide variety of commodities handled at Hong Kong, tea, silk, oil, sugar, tin, rice, camphor, cotton and cotton goods are the chief. The island is, further, a British military and naval station of first importance, and has important industries, the chief of which are sugar refining, shipbuilding and repairing, rope making, tin refining, tobacco manufacture, cement manufacture and the manufacture of knitted goods. Deep-sea fishing also is important. Kowloon is joined to Canton by railway.

Shanghai (Fig. 140) is situated in the Kiang-su province of China on the Whangpoo River south of the estuary of the Yangtse-kiang. It is the outlet of the Yangtse basin, the most fertile and most densely populated area of China, and acts as the entrepôt for this region, for the northern and Corean ports, and, to some extent, for Japan. The city has a number of cotton mills, and may be considered the principal centre of the cotton industry in the Far East. The principal exports are cotton, tea and silk; the main imports textiles, tobacco, sugar, coal, metals and kerosene oil.

AUSTRALIA

Sydney (Fig. 141) is situated on the south-east coast of Australia in New South Wales, and is the chief port of Australia and the capital of New South Wales. Its position was assured in the early days of colonisation, when its beautiful bay attracted Captain Cook, and the site was afterwards utilised as a convict settlement. The harbour, known as *Port Jackson*, has been of immense importance in the development of the town, for it is perhaps the finest in the world, being very spacious and well sheltered, and having deep water at all states of the tide. Moreover, the hinterland is very productive and good communications have made the port easily accessible. Coal and iron, found in the neighbourhood, support several industries, including railway, tallow and soap works; tobacco, boot and meat-preserving factories; flour mills, sugar refineries and tanneries. Wheat, coal, meat, wool, ores and fruits are exported.

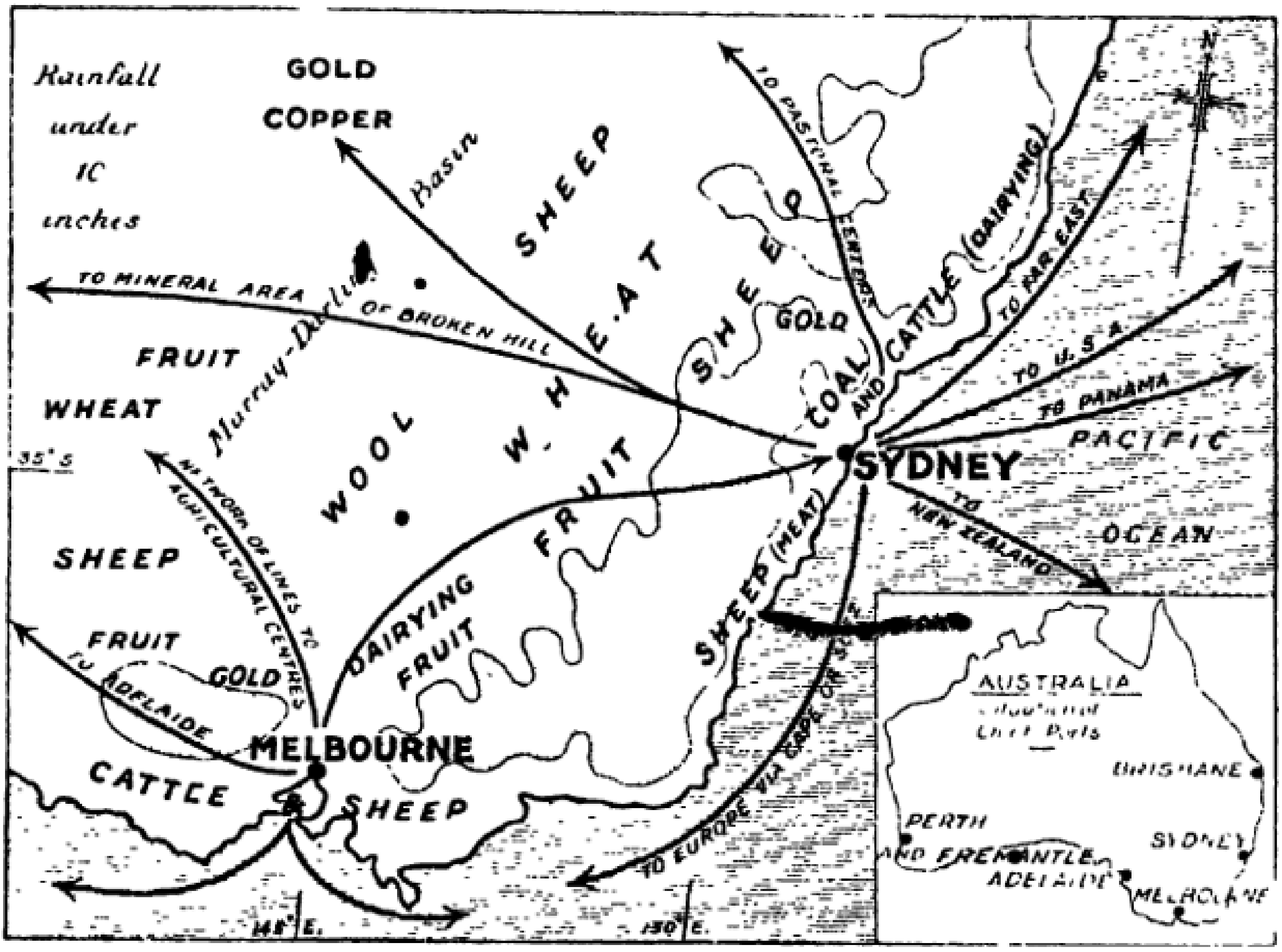


FIG. 141: THE IMPORTANCE OF SYDNEY AND MELBOURNE.
(Dotted areas indicate highland.)

Melbourne (Fig. 141), the second seaport of Australia, is the capital of Victoria. It stands on the south coast, north of Tasmania, at the northern extremity of Port Phillip bay on the River Yarra Yarra, a few miles above Port Phillip. The entrance to the harbour is rather narrow, but the waterway inside is safe and commodious. It was probably the good harbour that first attracted colonists to this port; now many railways converge upon it and it exports a great variety of products, including wool, wheat, butter, gold and wine. Melbourne is a busy manufacturing city, its industries comprising tanning, fell-mongery, wool-washing, bacon-curing, flour-milling and brewing.

Adelaide (Fig. 141), the capital of South Australia, situated on the Torrens River, has as its outport Port Adelaide on the Gulf of St. Vincent. The importance of the town is largely due to its splendid situation. It is an important mail port for all the eastern states of the Commonwealth, and is also important as a telegraph station, especially as it is connected by transcontinental telegraph with Port Darwin (North Australia) and so with the oceanic cables of the Old World. It has an extensive agricultural hinterland and is the principal wheat port of Australia. Wool, copper and silver also are exported. The principal industries are the manufacture of woollens, earthenware, and iron goods, together with brewing, starch-making, flour-milling and soap-boiling.

Brisbane (Fig. 141), the capital of Queensland, is situated on the Brisbane River and is accessible to ocean-going vessels, although the harbour is not a good one and requires constant dredging. It is on the eastern coast of Australia, about 500 miles north of Sydney. There are several better harbours on the Queensland coast, and this fact tends to diminish the importance of Brisbane. Its position is largely due to its being an outlet for part of the fertile Darling Downs and the highlands of the hinterland—rich in mineral wealth. It has valuable exports of wool, frozen meat, coal, copper and tin. The industries include boot factories, soap works, breweries, tanneries and tobacco works.

QUESTIONS ON CHAPTER 16

1. What is the position and importance of Vancouver, San Francisco, Rangoon, Buenos Aires, Marseilles, Shanghai? (*S.A.A. Prelim.*, *May*, 1929)
2. Choose *six* of the most important ports in the overseas portions of the British Empire. State the position of each and give some account of its activities and the reasons for them. (*S.A.A. Prelim.*, *May*, 1931)
3. Describe carefully the positions of *any three* of the following towns and note the importance of each :- Southampton, New York, Singapore. (*C.I.I. Prelim.*, 1930)
4. Draw sketch-maps to show the geographical factors which have influenced the growth of the following towns :- Liverpool, New York, Montreal, Bombay, Paris. (*C.I.S. Prelim.*, *June*, 1929)
5. Account for the development of London as an industrial centre although not situated within the great coal and iron districts. (*I. of B.*, *Qual.*, 1928)
6. Discuss the comparative advantages from the point of world trade of London, Antwerp, Rotterdam, and New York. (*I.C.W.A. Prelim.*, *June*, 1931)
7. Compare and contrast the positions of Paris and Rome as centres of national life. (*L.M.*, *June*, 1925)
8. Give a brief summary of what you think are the claims of Liverpool to be considered a serious rival to London as Britain's chief port. (*I. of B.*, *Qual.*, 1926)
9. Select any *two* sea-ports of world-wide importance, outside the British Isles, and describe their position and activities as fully as you can. (*C.S.*, *April*, 1925)
10. Indicate *by sketch-maps alone* the factors that have contributed to the development of Hong Kong and Singapore. (*I. of B.*, *Qual.*, 1934)

CHAPTER 17

MAN IN MANY LANDS

Any attempt to describe briefly the mode of life of man in the more important regions of the world can deal only with general characteristics, for it is obviously impossible in a small compass to discuss in detail the many variations which occur in each of the regions selected. In any case, the descriptions given here must be read in close conjunction with the review of the climate and vegetation of the regions which has already been given in Chapter 9, and reference should be made thereto in connection with each section of the present Chapter.

THE TUNDRA

The Tundra, or " Barren Lands," stretch in a belt round the world north of lat. 65°N. It is the farthest north that man can live, for beyond it lies a region of permanent ice and snow incapable of supporting human existence. In spite of its severe climatic conditions, the Tundra provides subsistence for various small, scattered tribes such as the primitive Eskimos, Lapps, Samoyeds, Tunguses, Ostyaks, Yakuts, Chukchis and Yuraks.

The more prosperous of the tribes, such as the Lapps, keep herds of reindeer, which remarkable animal—the only animal of importance native to the Tundra—satisfies nearly all their needs, providing them with transport, milk, meat, clothes, shelter and weapons. Indeed, to these people the reindeer is the standard of wealth, for to possess many reindeer is to be rich, whilst to have few reindeer is to be considered poor. The tribes supplement their existence by hunting and by fishing from the many great rivers, such as the Ob and Yenisei in Siberia and the Mackenzie in Canada, which cross the region. These rivers are all ice-bound for about seven months in the year and in flood in the early summer, but they are nevertheless an important source of food to the inhabitants of the surrounding country.

Occupations and Dwellings

In view of the conditions, life in the Tundra cannot be other than one of hardship and privation, and all Tundra tribes reveal the effect of generations of such a life by their low stature and stunted growth. The summer occupations consist of hunting and fishing, and during this short period sufficient food must be caught and prepared, not only for immediate consumption, but also for storing against the long, dreary winter. The hunting and fishing are the work of the men, whilst the women dry and prepare the fish for storage and use in the winter months. The women, helped by the children, also milk and tend the reindeer. The life is necessarily nomadic, for the reindeer must wander from place to place in search of food and the tribes must follow the animals which are their main support. Hunting and fishing, too, necessitate a constant search for new hunting and fishing grounds as the old ones become exhausted.

To meet these conditions, the characteristic dwelling of the Tundra tribes consists of a tent, which is easy to erect, strike and carry. The summer tent, or " choom ", is made of skins or bark stretched over a pole framework, with a hole at the top through which smoke can pass. A site near a lake or river is chosen, the tent is pitched, and the floor is covered with a layer of dry moss. Beds and seats are merely reindeer skins spread on the floor around the tent. The cooking pot is suspended in the centre from the pole framework, and hangs over a flat stone on which a fire is made.

When it is decided to move to new pasture or to a new hunting ground, the men go ahead to hunt or fish or follow the reindeer, leaving the women to strike the tents and pack the belongings. The women then follow the men, and pitch the tents on the new ground. With the coming of the cold season, the tribes move south to winter quarters. The winter is spe[redacted]m or in a more permanent dwelling made of earth or turf, and the floor is covered with layers of skins to conserve warmth. Work for the men is almost at a standstill, except for the making and preparing of weapons, and the hunting of furred animals on the edge of the forests. The women, however, are busily engaged in making clothes and tent coverings, in preparing the furs, and, with the help of the children, in looking after the reindeer. Even in winter, the life is more or less nomadic, for the reindeer move as they exhaust the moss on which they feed at this period.

Clearly, in such conditions, very little provision can be made for the future and life is little better than a hand-to-mouth existence and a continual war against Nature. Small wonder, then, that the people have scarcely any sentiment. Marriage, if it exists, is merely a matter of convenience, and no care is taken of the sick and aged. Those who fall by the roadside as the tribe moves on must be left to die since delay may be fatal for the others, and the already overburdened animals cannot be spared to carry those who are unable to move themselves.

Clothing and Implements

The clothing worn by Tundra tribes is made of reindeer skins and of the skins of animals caught in the hunt. The dresses are primitive, consisting of loose garments rudely shaped and sewn with thread made from the sinews of reindeer. Hoods, fur gloves or mittens, and fur boots are an essential part of the equipment. For transport purposes the sledge and ski are used, and for hunting the bow and arrow is the most common weapon, although firearms are now coming into more general service. To avoid injury to the pelts, the natives rely on blunt arrows in hunting the more valuable furred animals. Lassoes, axes, knives and other primitive weapons and implements also are used. The lassoes are made from reindeer skins, the axes are usually of stone, whilst the bows and arrows are commonly made of bone.

The Eskimo

The Eskimos of North America and the coasts of Greenland are the most northerly inhabitants of the world. They are a coastal tribe of skilled fishermen and hunters. Fishing is carried on in light canoes known as " kayaks," and the fish are caught by means of harpoons, in the use of which the Eskimo is an expert. The harpoons, bows, and arrows, are made of bone, while clothing is made of bird-skins and the skins of furred animals. Animal fat, the most widely eaten food, is used also as fuel. In summer the Eskimos lead a nomadic life and live in skin tents, but the winters are spent in " igloos " made of ice and snow. The lot of the Eskimo has been much improved in recent years by the successful introduction of the reindeer, first into Alaska and more recently into Labrador, and thanks to this, the life of the Eskimo should in the future be much more secure.

THE COLD TEMPERATE FOREST ZONE

This zone extends approximately in a belt round the world between lats. 60° and 65°N. It is a land of widespread coniferous forests, so vast that they have not yet been opened up by man to any great extent. In many of these forest areas, human penetration has been confined to the river courses, where the trees grow in such thick profusion that an erroneous idea of the density of the forests has been created in the minds of many travellers. Actually, the forest away from the rivers is much thinner; indeed, there are large areas of open spaces without trees of any kind, whilst in many parts the trees are quite sparse and somewhat undergrown.

On the other hand, the trees in the wetter and warmer parts reach enormous size, and on the Pacific seaboard of North America (especially British Columbia), for example, are some of the greatest forest giants in the world.

Unlike the equatorial forests, with their dense, almost impenetrable undergrowth and numerous species of trees, the coniferous forests have little or no undergrowth, while in many parts are found vast " stands " consisting entirely of the same variety of tree. In some districts, acres are covered with nothing but spruce; in others, pine trees alone are found over an area of several square miles.

On the whole, the conditions are not conducive to the development of a large human population, and only by incessant toil and unfailing skill can man obtain a reasonable livelihood in this region. The forest abounds in animals of great variety, and nearly all of these are of value because of their fur. The sable, ermine, beaver, bear, fox and lynx are the most prized from this point of view, while the various species of marten, such as the pine-marten and stone-marten, are also important. Other animals—more valued as a source of food and skins—are the elk, the moose, the reindeer and the caribou.

The Indians of North America

The coniferous forest region of North America is the land of the Red Indian. The white man has established trading posts at various points on the edge of the forest, but the hunting and trapping are done

[*Photo by W. F. Taylor.*

A LABRADOR FUR TRAPPER OFF ON HIS ROUND.

With his equipment on his back the trapper sets out on a journey through the snow-bound coniferous forest. His activities may keep him from home for months at a time.

for the most part by the native trapper. In the summer the Indians come in from the forests with their collection of furs, and barter them at the trading posts. They remain in the camp during the summer season, either enjoying a vacation or most probably working for the Hudson Bay Company or for some other trading corporation. On the approach of autumn they again disappear into the forest. Each family or tribe goes off to its own hunting grounds, in which the Indians have property rights which are respected most scrupulously both amongst themselves and by the white man.

The family furniture of the Indian is the canoe. At every portage, *i.e.*, places where the river is unnavigable, everything has to be unloaded and carried past the rapid or fall as the case may be. To reduce this trouble as far as possible, the Indian's household goods and equipment are reduced to the minimum. A tent, a stove and stove-pipe, steel traps, cartridges, an axe, a saw, a knife and a bucket constitute the whole of the equipment, except for a small amount of clothing and perhaps a little food. The first winter camp is established in the home hunting-ground and there the tribe lives for some months—fishing or hunting, and living on the meat obtained from the animals whose furs are being collected. The stove and stove-pipe (the result of contact with the white man) are of great advantage to the Indian. The tent may be pitched over three feet of snow, but the stove and a thick covering of fir tree boughs keep it warm, even with an outside temperature of 40°F. below zero. Using this camp as his base, [illegible]ian makes his round, staying away for perhaps two or three days at a time. He sets and visits his steel traps, shoots the large animals when opportunity occurs, and occasionally obtains bears by means of deadfall traps.

This way of life is extremely hard. The food is poor and irregular in supply, so that only a small population can exist, and mortality is high, especially amongst the children. The hunter may be caught by wolf or bear, and the rest of the family may perish of starvation. Although contact with the white man has brought benefits, it has brought also disadvantages, for, whilst hunting has been made easier by the white man's weapons, game has become scarcer and the Indian has to go farther to find it. The white man has also brought strong drink and disease—measles and influenza are far more deadly to the Indian than to the white man.

The Siberian Forests

These forests are inhabited by Ostyaks, Samoyeds and similar tribes, who hunt fur-bearing animals and whose mode of life, after allowing for climatic differences, is similar to that of the peoples of the Tundra. Even the most skilled and experienced huntsman is at the mercy of chance. Whatever the game he pursues, he can never be sure that he will find it. One day his kill may be large, the next may bring nothing at all. Some animals, notably the beaver, have been almost exterminated, whilst others have withdrawn into the remote fastnesses of the forest. Even so, the number of skins brought annually from Siberia to the markets both in Asia and in Europe is computed in millions.

The North American Forests

Life is much the same in the vast belt of forest which stretches south of the Tundra region of North America. Here the trees vary considerably both in type and size according to the climate. In the extreme north are mainly spruce, larch and pine, but, owing to the unfavourable climatic conditions, the trees do not attain any great size and are, consequently, of little commercial value.

Further south, however, and especially on the Atlantic and Pacific coasts where the rainfall is heavier and the climate less extreme, the trees reach enormous size, and grow in vast and valuable stands of the same species of tree.

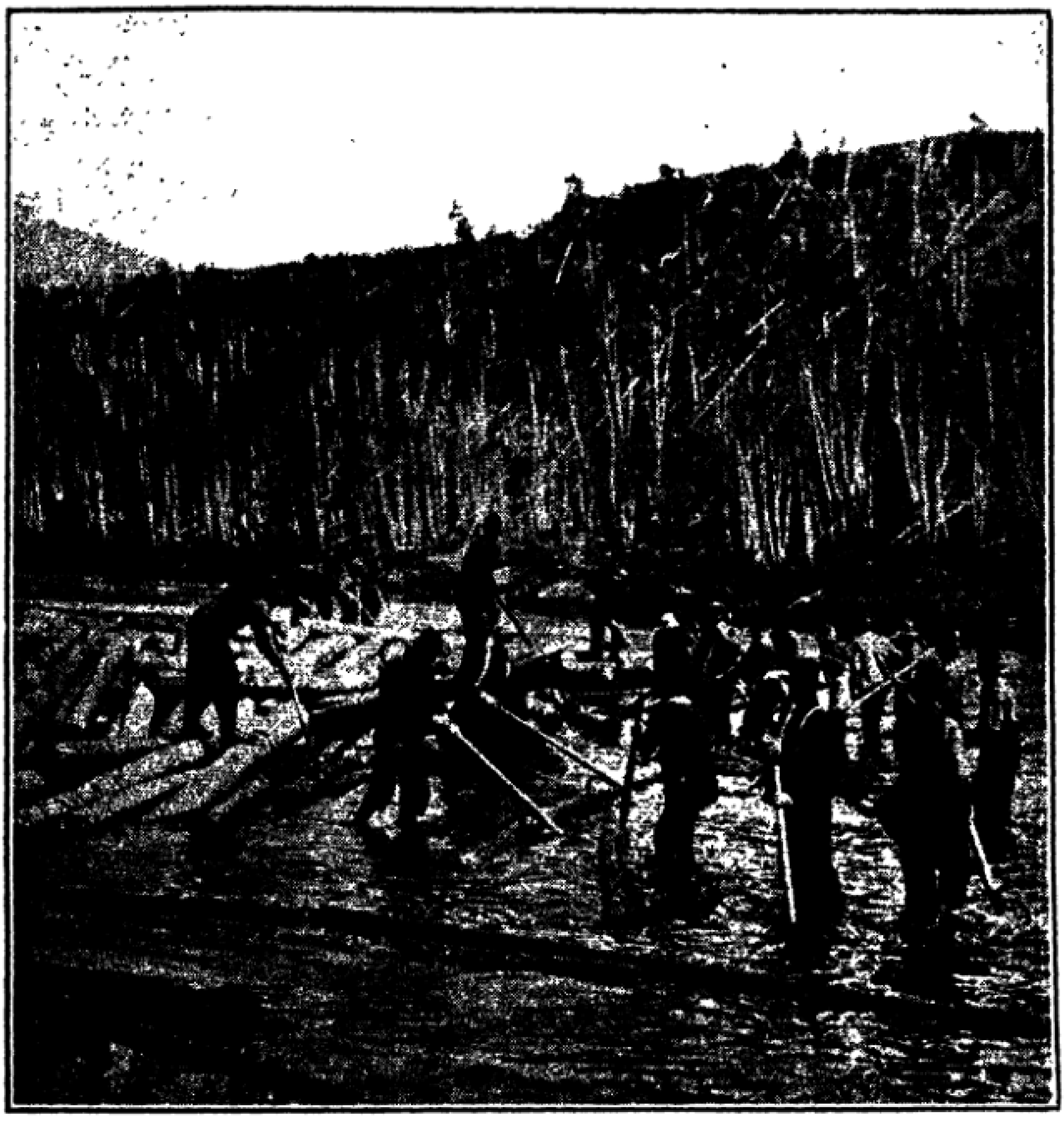
Further south again the coniferous forest merges into the true temperate forest, comprising trees both of the coniferous and of the deciduous types, such as pine, larch, spruce, cedar and the broadleaved oak, maple and chestnut. Here also the trees grow to great size, and constitute a highly important part of Canada's natural wealth.

Lumbering

After the trapper comes the lumberer. He enters the forest at any place where good transport by water is available for his logs. During the winter the forest echoes to the sound of axe and saw. Billions of cubic feet of timber are felled, and the logs are drawn to the frozen river to await the spring thaw. Then the logs go rushing down-stream to the saw-mill, where the wood is sawn into planks or ground into pulp for paper. The journey from forest to saw mill is fraught with considerable danger to the lumberer. Often thousands of logs become jammed in the stream, and then the lumberer has to find the key log, the moving of which with his hook will free the entire " jam ". Such work calls for great physical strength, skill and agility, and not infrequently results in disaster.

During the felling season, the lumberers live in camps, where the buildings are naturally made of wood. Life in these camps is not as hard as that of the hunters, for the lumberers enjoy many of the amenities of modern civilisation (including the telephone and the wireless), and when in spring work in the forest ceases, some of the men move to the more hospitable south, perhaps to find congenial harvest work on the wheatlands, while others go down stream to the saw mills.

In parts of this region the life of man differs markedly from that here described. In some districts white men have penetrated the forest and brought with them their knowledge and invention to establish oil-wells, power factories and chemical works. Nevertheless, the forest remains for the most part a region of furs and timber, and will doubtless so remain until those products are exhausted by the present wasteful manner of their exploitation.



[*By courtesy of the Canadian Pacific Railway*.

A LOG JAM ON A CANADIAN RIVER.

Lumber men use their hooks to loosen the logs and push them down stream to the saw mills.

THE COOL TEMPERATE ZONE

In this zone man has advanced more than in any other region of the world. It comprises the western and eastern coastal margins of continents between lats. 40° and 60°, as well as the great interior grasslands or steppes, though in the latter life and progress are entirely different from those of the coastal regions.

The Coastal Regions

In the coastal areas of the cool temperate zone are to be found the most advanced civilisations. They are regions of great climatic advantages, where rainfall and temperature combine to produce the most invigorating of all climates. Moreover, no other regions provide such a variety of resources, so that it is only natural that the races native to these coastal areas should be the most active in the world. Originally, these lands were clad with deciduous forests, interspersed here and there with marshes on the lowlands and moors on the higher ground; but man has cleared away most of the forest and has used the land to grow his crops of wheat, barley, oats and rye; to provide pasture for his cattle, and to furnish sites for his wonderful cities and his restless industrial towns.

Life in these coastal regions in the Northern Hemisphere is one of great variety and marked activity. The occurrence of coal and iron in close proximity has resulted in the growth of numerous manufacturing towns and cities, where millions of people find work. Every conceivable kind of material is manufactured, and cities have developed so rapidly and so widely that their organisation has become an urgent social problem. Both food and water have to be transported to the workers in large quantities, and frequently over great distances. A multitude of subsidiary industries springs up; smoke from a thousand chimneys pollutes the atmosphere; the adjoining country is turned into a refuse dump; and in the absence of counteracting influences, the crowded conditions of the cities result in time in a weakened population.

The Interior Regions—Grasslands

The interior of the cool temperate lands are quite different in character. Here life is simple, more primitive and usually more healthful. The climate tends to be extreme. The natural vegetation is grass, and the natural inhabitant of such lands is a pastoral nomad. In North America, for example, where the grass lands are known as *prairies*, the native Indian tribes were hunters rather than keepers of cattle. They moved as their main food, the bison, moved from place to place in search of better pasture. The incursions of white men from the more favoured portions of the temperate zone caused both the bison and the Indian almost to disappear and transformed the prairies from a pastoral into an agricultural region. The white man saw that more was to be gained by the cultivation of the fertile soil of the grasslands than by hunting the animals which roamed there at will. So it has come about that these lands now produce wheat in such vast quantities that they are well described as the granaries of the world.

The drier portions of the grasslands, however, are still used for pasture rather than cultivation. Here large herds of cattle are kept under the care of "cowboys," many of whom are half-breed Indian nomads. Some of these lands, as, for example, the North American grasslands, produce vast quantities of cattle and beef-products for export. These developments have been made possible by mechanical invention. The railway, the reaper, and other apparatus have enabled man to transplant himself from the coastal areas to these inland regions and to draw from them a profitable return for his labour. Before, only nomadic tribes were able to find a reasonable livelihood on these vast and inhospitable lands and, in time, even they were driven to turn elsewhere for food and clothing as their numbers increased and they pressed upon the available limits of subsistence. For this reason it was that, at various periods of the world's history, primitive nomadic tribes, with their horses, flocks and families, battered at the gates of more advanced communities and civilisations. At different times, western Europe has been over-run by Scythians, Goths, Vandals and Huns whilst China has received similar visitations from the Tartars, Mongols and Manchus.

The Russian Steppe Dweller

Perhaps no tribe at the present day reflects the grassland environment so clearly as do the *Khirghiz* of the Russian steppes. The domain of these nomadic herdsmen extends from the Don and the Volga to the Tian-shan, and from the middle Irtish, southwards past the Balkhash Lake, almost to Khiva and Bokhara.

The Khirghiz are essentially nomadic pastoral dwellers ; their most important animal is the horse, and the wealth of each man is expressed by the number of horses in his possession. Without a horse the Khirghiz herdsman deems himself the poorest of the poor. Hence, even the poorer Khirghiz reckons to have sufficient horses to provide one mount for each member of his family, though the richer nomads may each own as many as from six thousand to ten thousand horses, and these may feed in different herds at different places.

After the horse, the most important animals of the steppe dwellers are sheep, goats and camels, from which meat, drink and clothing are obtained. As may be expected from the mode of life of the people, the food of the tribesmen consists almost entirely of meat and milk and as practically none of the land is cultivated, there is scarcely any vegetable food.

In the summer months life in the steppes is one of continual wandering from place to place in search of pasturage for the herds and flocks. The winter quarters are left during April or May and the first summer pasturage is decided upon. When all the pasturage in the vicinity has been cleared, a move is made to some other suitable feeding ground.

Such moves may be made daily, but sometimes the pasture is sufficiently rich to provide food for several days. The horses form the vanguard of the wanderers and with them go the men. The women remain behind to strike the tents and pack the household goods on the camels and oxen. Then they, too, mount their horses and move onward. At midday there is much work and bustle as the milking is done. If a suitable feeding ground has not been previously found, the tents are pitched at sunset, the animals are again milked, and the journey is continued on the following day. Even when abundant pasturage is found, the herds and flocks must be driven further afield every day and brought back at night time, until the distance from the central camp becomes too great and another move has to be made.

[*By courtesy of the Citroen-Haardt Company*

MILKING TIME IN A PERSIAN NOMAD CAMP.

The animals are tethered in lines alongside the easily moved tents of their nomadic owners. The wool of the sheep is used for the wonderful rugs for which Persia is famed

During the period of the greatest summer heat the tribes move to the higher land, where it is cooler and where they can avoid the swarms of flies so injurious to the herds. The nomads leave for the lower land when the period of greatest heat is over, and eventually they return to their winter quarters. These are usually permanent, each tribe having its own traditional place, usually near a water supply in an area which has not been pastured during the summer months, and from which it is possible to cut grass for hay. In the neighbourhood of this camping ground rest the dead of the tribe, and here come the State officials to collect the taxes. The winter is generally an anxious time; if the season is severe the beasts are reduced to walking skeletons, and want and grief visit the camp.

The necessity for almost daily movement in search of sufficient food for the herds compels the adoption of a style of summer dwelling which is easily erected and dismantled, but which at the same time affords a satisfactory protection against the weather. These requirements are fulfilled by the " yurt ", which is probably the most perfect of all tents. It consists essentially of a lattice work for the lower upright circular walls of the framework, a coupling ring which forms the arch at the top, and spars for insertion into both in order to maintain their rigidity. Mats of tschi-grass and large wads of felt cover the lattice work, and thick felt carpets cover the floor. Even quite a large tent of this type can be put up or taken down in about half-an-hour. A wealthy Khirghiz may have six or eight yurts, but, as he is taxed on the number of yurts and not on the number of cattle, he prefers to decorate a few tents very lavishly rather than to have a large number. Most of the tribesmen use the yurt for a winter dwelling as well, but others prefer more permanent structures of willows or reeds with a reed-thatched roof. Such buildings are in any case erected to house the younger animals during the winter settlement.

Implements, utensils and clothes are made of light material, so that they are easy to pack and to carry. Leather and skins are used for clothing and also for utensils such as buckets, water bottles and milk bottles.

THE SUB-TROPICAL ZONE

This region embraces the belt of the earth's surface lying approximately between lats. 30° and 40°, though it may be taken to include also the northern parts of the monsoon areas on the eastern sides of continents, even though these parts are more tropical than sub-tropical in climate. The interiors of countries in this zone are desert, and reference will be made later to the mode of life in such areas.

"Mediterranean" Lands

The Mediterranean regions, situated on the western margins of the continents in the sub-tropical zone, are amongst the favoured lands of the earth, for they are particularly pleasant regions in which to live.

The hot, dry, monotonous summers are not conducive to energetic occupations, and the people tend to be indolent and unenterprising. In the Mediterranean lands of the Old World, the people work neither hard nor long, for the climate is too warm, and the daily siesta is a necessity in the climatic conditions. Agriculture is the principal occupation in all Mediterranean regions; wheat, the vine, olive, fig and various fruits (chiefly citrus) being widely cultivated.

In many parts the people are very backward. For example, in Turkey and Morocco most of the farmers use crude wooden ploughs tipped with a bit of iron ; they thresh the grain under the feet of oxen, and winnow it by throwing it to the wind. Sicily and Spain are almost equally backward, but Northern Italy is more advanced and everyone uses modern implements, even though these may be of a simple type. In southern Italy one finds the same lack of energy as in Spain. The Balkan Peninsula is a sparsely populated, backward agricultural region, with cultivation confined to the valley bottoms, whilst the rest of the country is mainly a difficult mountain area. The poverty of the land tends to create a certain wildness amongst the people, and brigandage is not infrequent.

Of all the Mediterranean lands none has developed so rapidly as California. At the end of the eighteenth century the Spanish friars introduced into this far country the plants of their homeland, and even now fine specimens of the vine, orange, lemon, olive and cork oak are to be seen in their monastery gardens. The industrious friars grew wheat and reared cattle in large numbers, and hides were established as the basis of Californian trade. After hides came wheat and lastly fruit. Later minerals, particularly gold and oil, helped this wonderful State to attain its present prosperous position. Nowadays thousands of people from the more energetic parts of the United States and indeed of the world go to California for rest and health, and, if they are under the necessity of earning [illegible] livelihood, they grow fruit and rear hens. The most remarkable modern development is that of film-making, the wonderful scenery and marvellous climate having been instrumental in making Los Angeles the centre of the moving-picture world. Thanks to these factors California may be said at present to be living upon "imported" brains and energy. Most of the people are from some other region, and doubtless geographers of the future will be interested to observe whether the climate has influenced the population of this pleasant land in the same way as it has done in other Mediterranean lands.

In contrast with the people of the grasslands and the tundra, the inhabitants of the Mediterranean lands live a settled life, carefully tending their soil and crops during the cool hours of the early morning or of the evening, but sleeping away the hours of greatest heat, and, except in the new countries, making little advancement. In the newer lands implements and utensils are of an up-to-date pattern, but in the older lands old-fashioned methods still prevail. Clothing is generally light, made mainly of cotton, and is imported from the manufacturing centres of Europe and the north-east of the United States. The buildings are of a permanent character, built of stone or brick. Many have flat roofs and are of one storey only, whilst others, particularly those in the large towns, are massively built and are several storeys high. The walls of all houses and other buildings are white or light in colour, and against these the multi-coloured tiled roofs and the brightly painted window shutters stand out in pleasant relief.

The food of the people naturally reflects the climatic conditions in which they live. Scarcely any menu is complete without its onions or garlic—both bulbous plants specially fitted to grow in a hot and dry climate. Macaroni, too, is an essential. while the general use of wine reflects the inadequacy of supplies of good water and the plentiful supplies of wine producing fruit. The scarcity of cattle means that butter is in most parts a luxury, and the poorer peasants therefore use olive oil as an appetiser on their bread.

Monsoon Lands

The monsoon lands are the exact antithesis of the Mediterranean lands. The rain falls in summer, the crops show a great divergence, and the people are entirely different in character. The heavy seasonal rainfall enables man to raise heavy crops and the result has been a dense —usually too dense—population. China and India are examples, both teeming with millions of people. All the monsoon peoples are agriculturalists, and, except in India, civilisation is based on rice, just as the civilization of the west is based upon wheat. Rice, however, needs much more care, and attention than wheat and more is required to satisfy human needs. So, in these lands, everyone painstakingly tills his own piece of ground; the whole family is pressed into service, to labour almost unceasingly while daylight lasts. Though the soil is so fertile and the rivers teem with fish, everyone has to work hard and every scrap of land has to be used.

The Chinese and Japanese are both yellow people, but they differ considerably from each other. Isolation has kept them apart from the the world for centuries, and, though Japan has climbed to a position of importance among world powers, the Chinese have remained much the same as they were hundreds of years ago. Their towns are walled towns with narrow crowded streets, and the houses are of one storey only with many rooms covering a large space of ground. The majority of the people dress in cotton, the wealthy in silk. Millions live on the rivers in boats. The rivers are the Chinese highways because the loess soil, which covers a large part of the country, is not suitable for the building of roads. Even in the south the winters are cold and in the north they are severe, so that the people—who have no wool—have to wear several thicknesses of thin garments to keep themselves warm. Even yet the mystery of the light woollen things worn by Europeans is said to be a source of untold wonder to the Chinese.

In Japan, conditions are somewhat similar. The food of the people is rice, and everyone has to work hard to wrest sufficient sustenance from the soil. Tea, fish and various jungle vegetables help to give variety to the diet. Here again the native houses of bamboo and paper are only one storey high. A light straw thatch forms the roof and, as will be imagined, such houses are very suitable for a country subject to earthquakes.

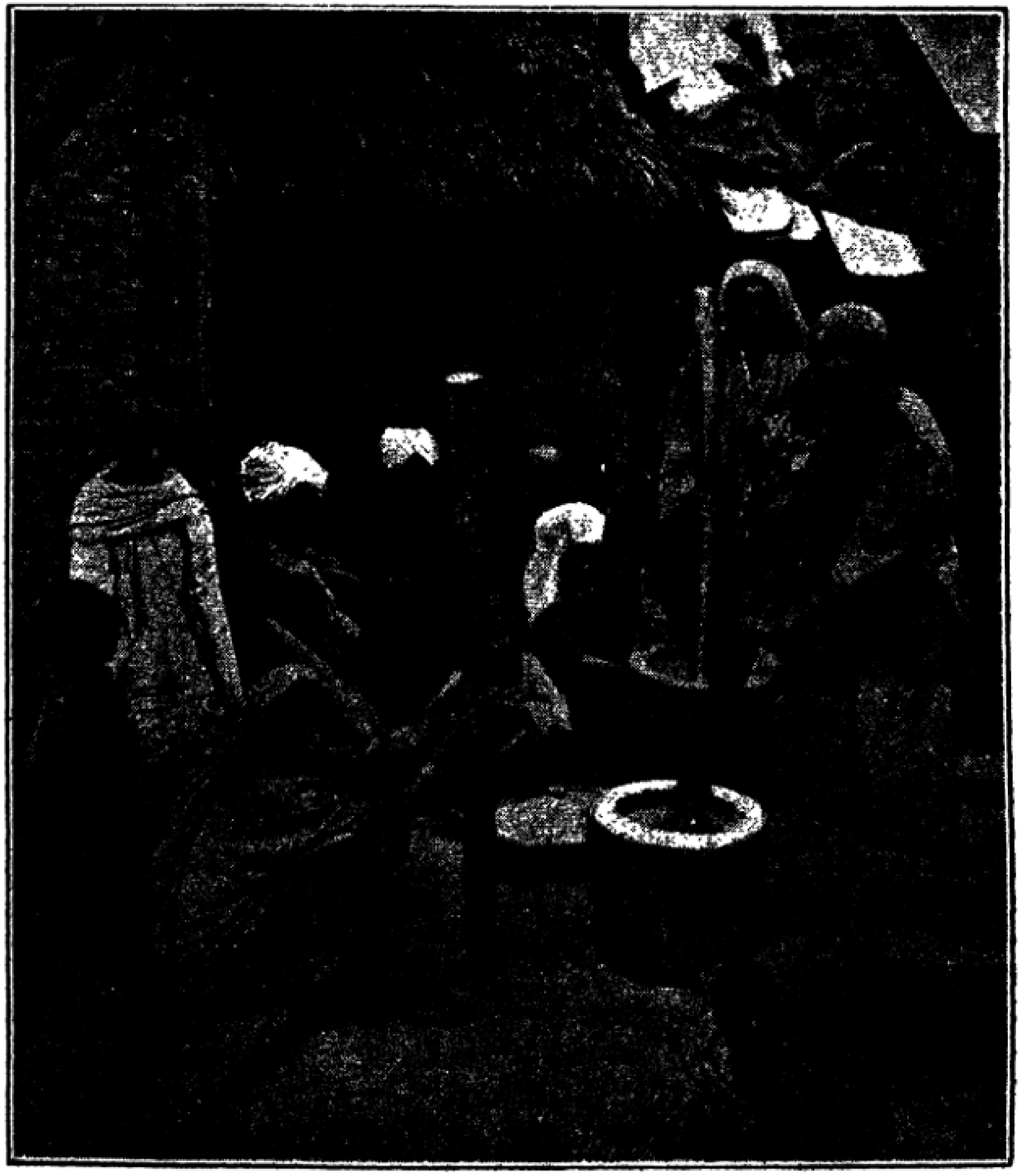
In Japan, far more so than in China, the influence of Western European and American contact has been profound. Indeed western clothes, western education, western architecture, railways and factories, may be said to have transformed Japan into a Britain of the East.

Much the same conditions prevail in Siam, with its rice-eating people, its vast rivers, its boats and its numerous Buddhist temples; in Burma with its pagodas, its elephants and teak forests, its rivers and boats, and its miles and miles of paddy fields supplying the staple food of the people; and in India, the land of teeming millions and the caste system which has held sway through the centuries.

In India the vast majority of the people live on millet or rice. Centuries of agricultural tradition have impressed themselves so strongly on the Indian people that even the rapidly rising factories and the industrialisation of the country do not prevent the workers from leaving factory or mine to tend their crops. Their life is bound up in the moisture-laden monsoon. They store the water in tanks in the drier parts: they build irrigation works in others. If the monsoon fails, the seed does not germinate and famine ensues. No countries suffer from famine so terribly as the monsoon countries. All alike are devastated and millions die. So complete is the dependence of the people on the monsoon, and so utterly unable are they to cope with its uncertainty, that they have become fatalists of the most extreme kind,—too ready to accept as the hand of fate or as the "will of Allah" misfortunes which might have been avoided by the exercise of a little foresight or intelligence. Fortunately the white man has been able to do much to help in this respect, especially in connection with the conservation of water supply and it is here that India, though soon to forget, owes such a vast debt of gratitude to her English rulers.

"Almost everywhere in India it would appear that, from time immemorial, the rural population has lived in small villages, the mud or bamboo houses of which are huddled together in a more or less compact area situated in the midst of the fields which provide the means of livelihood to their occupants. The farms and farmsteads which are so prominent a feature of the rural life of Western countries are almost entirely absent. There is no obvious link between the home of the individual cultivator and the fields he tills. His house is in the village, and the fields which make up his small holding are scattered over the area of land attached to it. In the south and east, holdings average about five acres; elsewhere not more than half of them exceed this limit . . . . Under the prevailing system of tillage, the small holdings do not provide occupation for more than half the time of the ltivator . . . .

"The main characteristics of village life are still those of the centuries anterior to British rule. Each village tends to be self contained; in each will usually be found some persons with permanent title in the land, either as owners or tenants with hereditary occupancy rights; below these in the scale are agricultural labourers, frequently of different castes from the actual cultivators; many (of the labourers) are members of the depressed classes; some work in the fields only at times of pressure and are mainly engaged in crafts such as leather work, or in tasks regarded as menial. The vast majority of the peasants live in debt to the moneylender, who is often established in their midst. Included



[*Photo by W. F. Taylor.*

SHELLING RICE BY PRIMITIVE METHODS.

The indolent natives of Cashmere, India, mingle work with neighbourly gossip. All members of the family—even the little ones—lend a hand in the preparation of the staple food.

in the village population will be certain village officials, generally hereditary, such as the headman, the accountant, the watchman—persons carrying different titles in different provinces, but representing the traditional organisation of village life. In all but the smallest villages, there are one or more skilled artisans, carpenters or ironsmiths, who provide and repair the simple agricultural implements, bullock gear, and water lifts. Household requirements are supplied by a shop or two, whose owners frequently provide the first market for village produce and add to their earnings by engaging in money lending. Almost invariably there is a religious building: a temple, shrine, or mosque."[1]

TROPICAL LANDS

The tropical lands stretch in a belt round the world extending approximately about 10° on each side of the Equator. They may be divided into the equatorial rain-forest areas and the savannahs.

Equatorial Rain-Forests

These forests, lying roughly within 5° north and south of the Equator, are always hot and always wet, so that vegetation grows to an extent unknown elsewhere in the world. The forest giants spread their canopy over the whole region, and all beneath is darkness or semi-darkness. The undergrowth increases with almost incredible rapidity, and the atmosphere is hot and steamy. Innumerable parasite plants, themselves deprived of strength-giving sunlight, live on the strength of the trees to which they cling and combine to form an impenetrable mesh of vegetation which presents a formidable barrier to human exploration. In such regions man is greatly handicapped in his struggle for existence. He has little energy since the climate never changes and is never invigorating. He is liable always to be attacked by tropical diseases, and his advancement in any direction is hindered by the conditions of his environment. Nearly all the tribes of the equatorial forest are short of stature, many of them so short as to be pygmies. It is doubtful whether even the tribes of the Tundra are more primitive than some of the dwellers in the hot, wet lands near the Equator. The various tribes of the Amazon basin, the Congo basin and the East Indian Islands are all amongst the most primitive races of mankind. In New Guinea, Borneo and Java, conditions are better than in the Amazon and Congo Basins, for proximity to the sea has a tempering effect on the climate.

Throughout the forest areas the dwellings are of bamboo or reed, and are frequently built on piles or in the tops of trees to afford security from the wild life of the water or from the vapours rising from the ground. Rice and sago are cultivated where clearings are possible, and innumerable spirits are worshipped to make the sago grow. Head-hunting is practised and dried human heads form a favourite decoration for both the family and the communal hut.

---

[1] *Report of the Indian Statutory Commission*. Vol. I, pp. 16 & 17.

Congo Pygmies

The dense forested jungle of the Congo Basin is inhabited by Negrillos, a race of pygmies about four feet in height, who may be looked upon as representing the lowest type of civilisation. They wear no clothes, build no homes, do not engage in cultivation, and hide themselves at the sight of a stranger. They are a race of hunters and fishermen, bartering their spoils for berries, fruit, vegetables and implements. Their weapons consist mainly of poisoned arrows, in the use of which they are greatly skilled. This, combined with their agility, make them formidable foes, though they frequently act as reliable guides and scouts. These primitive people build houses only when they settle for a short time at places where they foregather to conduct their bartering. Then they build huts of leaves which they abandon when their business is finished. Otherwise their life is one of constant wandering, with the trees for their home.

On the edge of the forests of the Congo, other tribes practise agriculture in the clearings. The women do most of the work, whilst the men are engaged in war or pleasure. Nature in these areas gives an abundant return for little labour, making the people indolent and backward.

Indians of the Amazon

The Indians of the Amazon Basin are in stages of advancement which vary according to the locality wherein they live. They range from tribes similar to the Negrillos to those who practise a well-established agriculture on plantations. The most primitive tribes are wandering forest savages, roaming from place to place in search of game, doing no cultivation, building no houses, and crossing streams on rudely made canoes which are abandoned when the crossing has been made.

In the clearings near the watercourse of the great river and its tributaries, there is a slightly higher type of civilisation. The tribes, only semi-civilised, build flimsy houses consisting for the most part of four posts supporting a roof of leaves. The native house, however, is only a shelter from the rain—privacy is not desired. A few utensils hang from the posts, and sometimes there is an upper floor reached by steps, while in other cases the inhabitants sleep in hammocks. In the cooler season, the women practise primitive agriculture and primitive arts such as spinning, weaving and pottery making, whilst the men roam the forests or engage in fishing, bartering their produce to traders who periodically visit the settlements. During the hottest period of the year the whole tribe migrates to the forest, taking a supply of manioc, and all engage in hunting to provide the remaining food requirements.

The tribes nearer the outskirts of the forests build better and more solid houses, while they have better weapons and generally lead a less miserable existence. All the tribes use the blow-pipe and poisoned arrows. One direct result of the everlasting wetness of the climate is the tendency to venerate anything really dry. To this end the people dry human heads until they have shrunk almost to the size of a cricket ball, and then they stick them on poles round their huts to ward off evil spirits.

"White" Civilization of the Rain Forests

With all his advantages, the white man has been unable to do much in cultivating this equatorial forest region. It is true that he has obtained rubber by pressing the natives into his service and wastefully exploiting the rubber trees of Brazil. But that effort has been short-lived for the best seeds were transported to other parts of the world, such as the East Indies, and used as the basis of successful plantations of cultivated rubber. On the mountain slopes, too, the white man has raised tea and coffee, while in the lowlands he has grown sugar, quinine and cocoa. Even so, 90 per cent. of the Tropics remains untouched. The white man suffers in the Tropics more than the native. He is the prey of diseases such as malaria, yellow fever and blackwater fever. These overcome his resistance, sap his physical and moral strength, and lead him to actions of which he would deem himself incapable in the temperate zone.

Happily science is enabling man to make a beginning with the conquest of this uninviting region. In Java under Dutch supervision the population has increased from less than one per square mile (the usual density in these areas) to over 800 per sq. mile, although much of the labour has been imported from the less enervating parts of the Tropics. The future holds out much promise for the equatorial regions, but at present it remains almost the worst of all human environments.

The Savannahs

The savannah lands lie north and south of the equatorial belt, roughly between 5°—20° on each side of the Equator. Here the rain is less continuous and the forests less dense, while there are large open spaces towards the outer limits. These are the tropical grasslands, sparsely populated, where the natives engage in primitive agriculture and which in places form ideal country for cattle farming.

For primitive agriculture, the brushwood is burned at the end of the dry season, and the farmer goes over the cleared ground with a pointed stick, making holes and putting in seed. A little rough weeding is needed until the plants are large enough to continue without attention, but no more work is done until harvest time. Yams, sweet potatoes and manioc are the chief crops raised by this method, and, though the native thus gets his living by working for only four months in the year, he is nevertheless capable of long hours of hard work and is by no means as primitive as the native of the wet forests.

Many of the native tribes are herdsmen and their civilisation is based upon cattle. They are frequently of fine physique, fond of fighting and possess great energy. The Hausa of the Sudan and the Masai of East Africa are typical. As a general rule, after due allowance has been made for differences in climate, the mode of life of the savannah peoples is similar to that of the Asiatic steppe dwellers, though the latter are at a more advanced stage of development.

In South America, the savannahs are little inhabited. A few scattered Indian tribes exist, and the population is increasing through immigration. In Africa, large areas are infested by the tse-tse fly, which is fatal to cattle and so makes pastoral activities impossible. The full development of these regions cannot take place until this scourge is eliminated. Nevertheless, vast areas of tropical grassland have been developed by man. The cotton region of the Sudan, the maize country of Queensland, and the cattle area of Brazil, are examples of savannah regions which man has developed to his profit and advantage.

THE HOT DESERTS

Deserts are regions of very low rainfall and therefore of little vegetation and sparse population. People cannot live permanently in the deserts, except in the small and isolated oases, where water from some underground source supports a certain amount of vegetation. If it were not for such oases and for occasional green patches where rain sometimes falls, the deserts would be entirely without human life.

Desert Nomads

The desert peoples of the Sahara are of mixed blood, but most of them are Arabs and Berbers, with negroes in some of the oases, and a few Tuaregs and Tibus in the Sahara proper. The nomadic desert tribes of Arabia are Bedouins, who wander for great distances over the desert, stopping for water at any place where water can be found, and while some of them are merely robbers, others trade the products of their flocks for the products of the oases at which they stop from time to time.

These desert people keep flocks of sheep, goats, donkeys, horses and camels, especially the latter, which is the characteristic animal of the Sahara desert, and has been successfully introduced into the Australian desert. All of these animals can live on the scanty vegetation, provided they are constantly moved from pasturage to pasturage.

The desert peoples are thus even more nomadic than the people of the steppe, and among them, as among the others, wealth consists in the number of animals they possess. Houses they cannot have, for their dwellings must be light enough to be quickly moved and carried over great distances. Consequently, they erect temporary tents made usually of skins, but sometimes of grass and brushwood. The Arabs are mostly poor, for, when there is insufficient pasturage for the animals, the camels and sheep give no milk and the colts and lambs die.

When hard-pressed by famine, the Arab makes raids on areas where there is food to be obtained. A dozen or twenty Arabs set off across the desert on camels, taking horses with them for the final dash, the horses having been specially trained to drink camels' milk. The Arabs may ride one or two hundred miles before they come to a camp which looks suitable for plunder. Then they wait until nightfall, when they drive off the camels from the encampment whilst the owners are asleep. After returning the Arabs do nothing for several days, so that according to western ideas they are dishonest and lazy. Indeed, their reputation is even worse among native tribes, and no greater term of contempt can be used by one native to another on the Gold Coast than that of "low Arab."

Nevertheless, the desert promotes many manly qualities. The people are fearless and reckless when necessary; they are faithful unto death when they have pledged their word; and hospitality is universal. So long as anyone has food and drink, he willingly shares it with his neighbour. And, even in the tents of his enemies, a man may find food and shelter and may remain safely from the evening of one day to the morning of the second day after.

Oases

In the oases are found more permanent populations. If the water supply is adequate and permanent the land is intensively cultivated and quite considerable crops of wheat, barley, maize, millet, fruits and other crops are grown. The houses are built of sun-dried mud or adobe, and are generally somewhat primitive in character. In the smaller oases palms are the chief vegetation, particularly the date palm. In the larger oases trading centres are established, which the caravans visit to exchange their goods, and to buy or sell camels and other animals. In addition to thus acting as markets, the trading centres carry on such industries as the drying of dates, the making of leather and pottery and the weaving of carpets. Trade of this character is particularly important on the Mediterranean borders of the African desert.

MOUNTAINS AND HIGH PLATEAUS

On the whole, mountain and high plateau lands afford difficult homes for man, so that, as a general rule, the populations are small and the regions are commercially unimportant. The peoples are distinctly "clannish," particularly in the mountainous areas. They cling to old customs, and usually have their own local dialects and modes of dress. Thus, in parts of Scotland Gaelic is still spoken, whilst one hears the Welsh language alone in certain parts of Wales. The Scots still wear the tartan and the kilt, while distinctive dresses—frequently very picturesque—are worn by the mountain dwellers of Europe and Asia.

Mountains

Mountains exert their influence on man in several ways. Altitude in itself has no great influence, for it is possible to grow accustomed to living at great altitudes, and there are people who live permanently at heights of some three miles above the sea. Such influence as is exerted is due to the climate and relief of these areas. The air is much rarer and the temperature more variable. The relief is rugged and thus movement is considerably more difficult than in plains. For these reasons mountainous areas are only thinly peopled.

Switzerland is a typically mountainous country, and the life of man in the higher parts of the Alps may be taken as an example of the influence of mountains on human development and activity. In the valley bottoms and on the lower slopes pastoral farming is carried on, cattle and goat rearing giving rise to dairying industries. Higher up the mountains are the valley meadows or " alps ", where in summer are to be found rich pastures but in winter merely a snow covered waste. Hence, a feature of mountainous areas of this kind is the annual migration of the herdsmen from the valleys to the mountain pastures, where they find rich food for their cattle and goats. Every spring, they go up the slopes with their herds, and live in little summer chalets whilst their beasts feed on the abundant herbage. As winter approaches, the chalets are closed and the peasants descend to the valleys, where their animals are fed indoors, and the people occupy themselves through the dark evenings with home industries such as wood carving, the making of intricate metal goods such as watches, and the manufacture of gloves and morocco leather goods. The women also undertake embroidery and fine needlework. Such conditions necessarily foster thrift, and make the people careful and hard-working.

Mountain lands are generally characterized by beautiful or interesting scenery and this attracts tourists. Switzerland, for this reason, has come to be known as the " Playground of Europe," where thousands of men and women are employed as hotel-keepers, servants, waiters, boatmen, guides and sports instructors in ministering to the needs of the numerous visitors.

To a smaller extent the same characteristics apply to the mountain areas of Britain (*e.g.*, Wales, the Lake District and Northern Scotland), where the people make a living from the tourist trade and supplement it during the winter by cattle-rearing or sheep-rearing and home industries.

Some mountain areas exert a vastly different influence on the people. The land may yield but a precarious living and the natives may assume a wild and lawless existence, waging constant minor wars and making periodical incursions to the plains in search of plunder. The tribes of Afghanistan and Baluchistan are of this type. They keep a few sheep and goats which can exist on the scanty mountain vegetation, and they weave blankets and carpets from the wool. They are, however, an unsettled people and a source of constant trouble to the neighbouring Indian states. It is much the same with the peoples of the Balkans. Although they have a higher type of civilisation than the Afghans, they are constantly at war either with themselves or with others, and delight in bloodthirsty quarrels.

Mountain lands contribute to migration. As population tends to increase, the poor return for hard work compels many of the people to seek their fortunes elsewhere, and lands such as Norway, Wales and Scotland have sent large numbers of their inhabitants to other countries.

High Plateaus

High plateaus, too, exert a profound influence on the life of man. The best example of such areas is the plateau of Tibet. Here, at an altitude of some 15,000 feet above sea-level, is an isolated plateau shut off from communication with surrounding countries by almost impassable barriers of mountain ranges. The people are few in number and lead a somewhat nomadic existence by pasturing yaks, goats and sheep. The yak is to the Tibetan what the reindeer is to the Lapp. It supplies him with food and clothing, and is his chief means of transport.

Further south lies the real Tibet, with a more genial climate and a population of farmers and roaming herdsmen. Lhasa, the Tibetan capital, is in a charming valley. Here lies the great Lamaserai, the centre of a degraded form of Buddhism. Throughout this area are to be seen innumerable monasteries perched on rocky precipices and peopled by large numbers of priests. In Lhasa alone there are said to be over 25,000 priests. They are ruled by the Dalai Lama; and they have become isolated to such an extent that few of them have ever left the neighbourhood whilst very few white people have ever been in Lhasa.

The food of these people is plain and plentiful, but distinctly unpleasant to western palates. No part of the world has remained so isolated and so free from contact with modern civilisation as Tibet. And no area in the world shows so clearly how profound is the influence of environment on the life of man.

QUESTIONS ON CHAPTER 17

1. Say what you know of the conditions under which any *two* of the following men live and work :—

   (*a*) A tea planter in Ceylon.

   (*b*) A sheep farmer in Australia.

   (*c*) A fisherman in Newfoundland. (*C.S., May*, 1927)

2. In the case of *one* of the following regions, describe the scenery and the occupations of the inhabitants. Explain how the occupations are influenced by the natural conditions (relief, climate, etc.) :—

   (*a*) Norway ; (*b*) The forest region of N. Canada.

   (*c*) The veldt of S. Africa. (*C.S., March*, 1928)

3. Describe the life of any *two* of the following, pointing out the extent to which their activities are affected by their geographical surroundings :—(*a*) Danish dairy farmers ; (*b*) Swiss farmers ; (*c*) Newfoundland fishermen ; (*d*) Laplanders ; (*e*) Indian rice-growers. (*C.S., March*, 1930)

4. Describe briefly the life of the inhabitants of *two* of the following regions, giving such explanations as you can :—An equatorial forest, the Asiatic steppes, an island in the Mediterranean, Labrador. (*C.S., Dec.*, 1929)

5. Compare the life of an inhabitant of an island off the west coast of Scotland such as Skye, with that of an inhabitant of a Mediterranean island, such as Majorca or Cyprus. What do you regard as the main cause of the difference ? Give reasons for your opinion. (*C.S., March*, 1928)

6. Describe (*a*) the climatic conditions and (*b*) the mode of life of the inhabitants of TWO of the following regions :—

   (i) Ireland, west of the R. Shannon ;

   (ii) the Congo Basin ;

   (iii) the Tundras of Northern Canada ;

   (iv) the Plateaus of Tibet. (*C.S., May*, 1929)

7. Write a short account of *one* of the following :—

   (*a*) The influence of changes of fashion (personal and domestic) in promoting or hindering the development of industries. Give instances of such industries with their locations.

   (*b*) The influence of climate on the life of *either* the Eskimo *or* the inhabitant of the Asiatic steppes.

   (*c*) The difficulties that white people have to contend with in opening up equatorial forests. (*C.S., October*, 1927)

8. Name *three* peoples that live principally by hunting or fishing. Select *one* of these and write an account of their way of living. (*C.S., April*, 1928)

9. Give a careful account of the climatic conditions found in the great coniferous forests of the Northern Hemisphere, showing how far these conditions limit human life and activities. (*London University Inter. B. Com., July*, 1933)

10. Write a short essay on "The influence of geographical conditions on human life in Tibet and in the Sahara." (*C.S., March*, 1925)

CHAPTER 18

ARTERIES OF COMMERCE. LAND TRANSPORT

The continuous and increasing interchange of products between the different communities of the world, which we know as "Commerce," is fundamentally dependent on transport facilities. Indeed, the importance of all forms of transport in all spheres of modern life, especially the commercial and industrial, can hardly be over-estimated. Transport has been a prime factor in the economic development of all countries and it is generally true to say that where transport facilities have been most highly developed, progress has been most rapid and profitable. Without canals and improved roads the great movement known as the Industrial Revolution, could scarce have begun ; without rapidly developing railways and steamships, it could certainly not have progressed.

In the seventeenth and eighteenth centuries countries were made up of relatively small communities which were almost self-contained so far as everyday needs were concerned, for the high cost of transport made it impracticable to move any goods other than those of high value and small bulk. Practically every four years the leading countries of the old world were faced with scarcity and some even with famine, for, though across the Atlantic there were vast possibilities for producing food on the virgin soils of the Americas, land transport costs were still too high to allow these fertile lands to be used to advantage.

The development of canals and the improvement of roads did much to change these conditions and led to the rapid growth of a *national* economy ; but only with the coming of railways was the foundation of a *world* economy made possible. The development of steamships was, of course, a vital factor, but that alone would not have rendered possible the supply of wheat from America and of frozen meat from Australia, because of the impossibility of getting these products to the coast for shipment.

In the modern world, the intense specialisation of industrial processes and the application throughout industry of the principles of the division of labour are rendered possible only by the existence of an efficient and widespread system of transport. The factory system necessitates the gathering together in selected places of vast numbers of workers and of a wide range of raw material drawn from different parts of the world. Workers to-day have not only to be housed, clothed and fed, but have also to be transported daily to the factory—in many cases quite a considerable journey; the raw materials have to be collected and transported from port or countryside, and finally, the manufactured products must be carried away to their market. All these demand a highly organised transport system, and one of the principal features of world development during the past hundred years has been the phenomenal improvement in the various transport services, and the consequent great reaction upon national life and the standard of living.

Modes of Transport

The oldest form of commercial transport is, of course, transport by land and river. Early nomadic tribes in their search after food would come into contact with settled tribes and so, in time, would naturally develop with them a kind of barter trade, which would ultimately develop into a primitive carrying trade between one settled tribe and another. Thus would be founded the earliest forms both of transport and of commerce. The Bedouin, as we have seen, conducts this very kind of trade to-day as he journeys on his camel from oasis to oasis, and in much the same way the wandering Khirghiz trades his rugs as he travels on horse-back from one tribe or village to another.

Modern inland transport is of three kinds: (1) road transport; (2) inland water transport; and (3) rail transport.

ROAD TRANSPORT is the oldest form, for the nomadic carriers made their own paths to suit the requirements of the moment. In time these paths became well-defined, but were not, of course, roads in the modern sense of the term. The natural development from the human carrier was the training and domestication as beasts of burden of animals stronger than man, and this, in time, led to the use first of pack animals, then of wheeled vehicles drawn by animals, and, finally, to mechanically-driven vehicles using well-made permanent roads.

INLAND WATER TRANSPORT. The earliest method of river transport was by means of a raft floating with the stream. Later on people in various parts of the world used boats made of hollowed tree trunks ("dug-outs"), skins stretched over a frame ("kayaks"), or skins inflated and fixed together by pieces of wood; while to provide a means for travelling against the stream and for moving more rapidly with the stream, paddles, oars and sails were evolved. Where a river was obstructed by falls or rapids, travellers had to unload the boat, carry the cargo along the bank and transfer to another boat, or carry both cargo and boat bodily beyond the obstruction.

Modern inland water traffic is carried by means of horse-drawn or motor-driven barges and by steamers, while river obstructions are avoided by canals and locks. But even to-day, in undeveloped parts of the world, many of the primitive methods of water transport are still used. In the jungles, often the only possible track is along the waterways, while transport is mainly by river and canal on the highly populated Chinese plains where land is far too valuable to "waste" on roads. Even highly civilised communities utilise primitive methods where they are convenient and inexpensive, as, for example, the method of floating felled timber in the form of rafts downstream to the saw mills.

RAILWAYS developed rapidly after the invention of the steam engine, largely owing to the inadequacy of the 18th century roadways and waterways. Modern railway services are the quickest method of long-distance land transport, and they play an important part in modern economic organisation. They are essential for the economic well-being of isolated settlements such as mining communities, and, in spite of difficulties of construction in many countries, there is now in every country of any importance a network of railway lines linking up all the productive and industrial areas and providing direct routes to the ports.

OCEAN TRANSPORT is essential to world commerce. The first seamen were probably the inhabitants of the eastern Mediterranean lands, for the absence of high tides and of stormy water made easy the first attempts at sea navigation. Such people established the first fishing communities and, as they followed the coasts farther and farther from their base, they eventually left their own waters and reached new lands. These discoveries, at first haphazard and accidental, naturally led to organised expeditions of discovery, until in time the world as we know it to-day was mapped in outline, and all civilised communities were linked up by sail and steamer routes.

In the early days of ocean transport, sea-borne trade was confined to luxuries—highly priced commodities of small bulk which could be sold at such a profit as compensated for the hardships and risks borne by the mariner. The search for luxuries assisted in the discovery of new lands and was especially important in opening up the wealth of the Far East. The rapid development of the countries of Western Europe, resulting in a large increase in population, and the opening up of "new" lands eminently suitable for the production of foodstuffs, led to the foundation of a sea-borne trade in necessaries. Finally, the Industrial Revolution gave birth to a large trade between the manufacturing countries on the one hand and countries producing raw materials and food on the other.

Developments in ocean transport have lessened considerably the "time" distance between the various continents, and, with the opening up of the tropical lands, the increasing tendency to specialisation in the "old" industrial countries, and the continual cheapening of freights, this form of transport cannot fail to go on increasing in importance.

AIR TRANSPORT is as yet in its infancy, but it is undoubtedly a form of transport which will play an important part in world commerce in the future. There is unlimited scope for expansion: there is comparatively no limit to the space available in the air; overcrowding, except perhaps at the terminals, is a remote possibility; and physical features or geographical factors present very few obstacles to this form of communication. At present the greatest obstacles in the way of the development of air transport are the difficulty of finding suitable landing places; mechanical limitations to the power and size of aircraft; and dangers from atmospheric disturbances and from high mountain ranges. Experience and invention are, of course, rapidly overcoming the difficulties and we may anticipate that in a few years' time such amazing developments will have taken place that other forms of transport will feel the effects of the competition.

The Three Essentials

To be successful any system of transport must be able to offer a safe and adequate service at rates which are advantageous to the possible users of it and profitable or remunerative to those engaged in the business of carrying. To suit the type of traffic a compromise must be made between the speed of the service and its cost. Great speed always means high cost and cost increases more rapidly than speed. Nevertheless, in the case of perishable goods which must be disposed of immediately, or of goods for which the sellers must catch an early market, the consideration of cost of transport is secondary to that of speed. On the other hand, in the case of many other commodities, especially those of a bulky nature such as coal and gravel, the factor of cheapness entirely outweighs that of speed.

REMUNERATION. In considering the remuneration factor, it can be stated as a general rule that elaborate transport systems will not be constructed in any region unless there is a sufficient volume of trade to justify the initial expenditure and to provide enough revenue to cover running costs and a reasonable net profit.

The initial cost is frequently very great, as in the cases of the Manchester Ship Canal, the Suez Canal and the Panama Canal. These canals have proved extremely successful, and now play a part of inestimable importance in ocean transport and world commerce. Manchester has been converted into an important port; the Suez Canal caused a revolution in ocean trade routes and now provides a highly remunerative return to its shareholders; and the Panama Canal, which has greatly benefited the trade of the American continents, has been so markedly successful that steps are being taken to cut a new canal across Central America to cope with the additional traffic with which, it is anticipated, the Panama Canal will ultimately be unable to cope.

Railways as a general rule are remunerative, although severe competition in many countries, particularly that of road transport, has of late reduced their revenue. Some railways, however, are constructed in the first instance for other than commercial reasons. The projected Cape-Cairo railway, for example, has as one of its main objects the strategic advantages which would accrue to the British Empire, and it is most unlikely that such an extensive system running through undeveloped country would, at least for many years, be a commercially paying proposition. The Trans-Siberian railway, also, was constructed mainly for political reasons, although, as was to be expected, it is proving of the utmost value in opening up the land through which it runs. Similarly, the proposed railway across the Sahara is being advanced, not primarily to assist or to develop trade, but to link up France's African possessions both with one another and with the mother country.

Speed is an important factor in modern commerce, particularly in connection with the transport of perishable goods such as fish, milk, fruit, cut flowers, and certain vegetables. Modern railways and road transport have an advantage over water transport in this respect, but the " blue riband " of speed has now been wrested from the railways by the air services. Mails, articles of high value and small bulk, and expensive perishable commodities (such as cut flowers, early fruits and early vegetables) are frequently sent by air; but heavy commodities and light commodities which do not deteriorate with the passage of time can more profitably utilise the slower routes. Coal is sent from northern to southern England by sea instead of by rail; kaolin is transported from Cornwall to the Potteries by sea and canal instead of by rail; while cargoes of nitrate and wheat are still shipped half way across the world in sailing vessels instead of in more rapid but more expensive steamers.

In many instances, however, speed is essential irrespective of the type of commodity. " Time is money " now more than at any other period of the world's history, and very often the sooner goods can be placed on the market the more profitably they can be sold. From this point of view the traffic congestions in many of the large cities and ports of the world are to be greatly deplored, for they must result in a direct burden on industry and commerce. An increase in the volume of commerce necessitates an increase in the facilities for disposing of that commerce, and, in the absence of improvements to effect a quickening of transport services in congested areas, money in the form of time will continue to be wasted. This question of congestion is one of the greatest disadvantages of modern road transport.

Freight Charges are of importance both to owners and to users of transport services. Owners have to adjust their freight rates at that level which will prove remunerative to themselves and which will also attract custom. In general, freights (which are largely influenced by the method of transport and the type of goods) tend to uniformity for the transport of the same goods between any two points owing to effective competition. The quicker the method of transport, the higher the freight, because speed is expensive. Railway charges are generally higher than the charges for carriage by water, while air transport, being of all modern transport services by far the quickest, is naturally the most costly. In so far, however, as speed means quicker and more certain marketing of the product, the most expensive method may in the long run be cheapest. As we have already pointed out, for perishable goods the quickest and therefore most expensive methods will be the most remunerative, whilst for non-perishable and heavy goods, such as timber, it is most profitable to utilise the cheaper water routes. Again, the more expensive methods are utilised in some instances in order to place goods on the market as soon as possible, whilst in others cheapness of transport alone is responsible for capturing the market. Although the Midland coalfields are nearer London than the coalfields of Newcastle, the relative cheapness of transport by sea from Newcastle compared with transport by rail from the Midlands has prevented the Midlands from capturing Newcastle's coal trade with the Metropolis.

LAND TRANSPORT

Primitive Modes

There are numerous primitive methods of transport still in existence, but none is of any great importance. Human carriers ("porterage") are still employed in certain parts of the world, as, for example, in the

[Photo by W. F. Taylor.

Ancient Transport for Modern Purposes.

A primitive solid wheel cart alongside a typical modern residence in Cuba, West Indies.

tropical forest regions, where this is the only possible means of conveyance. Porterage is the most primitive and most expensive of all forms of transport, its obvious disadvantages being extreme slowness and the fact that the amount carried is strictly limited.

The next stage in the evolution of transport—carriage by animals stronger than man—suffers from similar disadvantages. At present this form is typified by camel transport across the great hot deserts, and horse pack or mule pack transport in various mountain areas. The horse is the most widely used of all beasts of burden. It is so used in almost all countries outside the Tropics, where it is rarely found because of its liability to disease from insect bites, *e.g.*, tse-tse fly. In south-eastern Asia elephants are used as beasts of burden, as, for example, in the Malay Peninsula, where they transport tin to the ports of shipment. The ass and the yak also act as beasts of burden in various parts of the world.

Wheeled traffic was introduced at a very early date and, in most countries, vehicles of various kinds are drawn by horses, mules, yaks, oxen and other animals. Dogs are used to draw light-wheeled vehicles in Germany and Belgium, and to draw ice sledges in Greenland and northern Canada. In Lapland, the chief means of transport is the sledge drawn by reindeer, while the snow-covered lands of Russia are traversed by sledges drawn by horses or dogs.

Modern Road Transport

Modern wheeled traffic is, of course, of little use unless it has the advantage of an adequate system of roads. It was for this reason that, until the eighteenth century, wheeled traffic made little progress, largely because the roads were poor and were constructed in a haphazard manner. With the coming of the internal combustion engine, considerable improvements were effected, and, even before 1914, there had been a great increase in transport by road, mainly because of the advantages of direct loading and haulage, and direct delivery in the suburbs of large towns. There was a still greater increase from 1919 onwards, mainly because of (1) the increased charges and labour troubles on the railways; (2) the cheapening of the cost of motor vehicles, petrol and tyres; and (3) the general improvement of roads.

ROAD PASSENGER TRAFFIC is carried by tramways and motor omnibuses.

Tramways require a permanent track and involve heavy expenditure. They are very inelastic, are unsuited to crowded areas, and rarely pay their way. On the other hand, they have a large carrying capacity; are more reliable in foggy weather; and the motive power (electricity) is cheap when produced on a large scale. The recent introduction of "trackless" trams should markedly lessen the disadvantages.

Motor omnibus passenger traffic has increased phenomenally within recent years, and almost every large town has numerous services serving its suburbs and outlying villages. Long distance motor-coach travel, too, has made rapid headway, and in England, as a result of the keen competition which has arisen between the railways and road transport, road powers have been granted to the railways. The motor omnibus is more elastic than the tram, it can develop traffic by tapping new areas, and is able to cover a wider district.

ROAD GOODS TRAFFIC has been less developed and is less highly organised than road passenger traffic, but it is nevertheless rapidly increasing in importance. It gives rise to the very material question of overcrowding on the roads, for commercial vehicles almost invariably start from a crowded district and have to pass through congested areas. They thus contribute materially to the traffic congestion in large towns and on some of the more popular roads.

Road transport is generally speedier for short journeys than other forms of transport because the vehicles need not run to scheduled times, and because there are no intermediate loading charges and delays. It also provides greater convenience and less risk of damage in handling because there is rarely any " breaking of bulk " or transhipment from one vehicle to another. The load is placed on the lorry or wagon at the loading point and is not touched again until it reaches its destination. Another advantage is that the intricate network of roads makes it possible for road vehicles to take up and transport goods almost anywhere, for nearly every habitable area is served by roads. Road transport is therefore very flexible, and the vehicles can go to any part of the country where traffic is available. Railways and canals, on the other hand, are limited to definite and prescribed routes covering a relatively limited area. As against this, there are the disadvantages that the reliability of road services is not yet by any means perfect, and that the carriers experience difficulty in obtaining return freights, so that empty journeys have often to be made.

The transport of goods by road is generally more expensive than transport by rail or water, but the higher charges of this form of transport are on the whole justified by the greater convenience of its facilities.

Railways

Railway transport is the best known and most widely used of all forms of land transport. For long journeys, as we have said, railways are considerably quicker than road or water transport and they are less costly than motor haulage. Every inhabited country has a railway service, the extent of which depends on the degree of the country's commercial development. In some cases the advent of a railway is the initial cause of progress, but, as a general rule, it is gradual development that attracts the railway. The discovery of minerals in Australia led to the construction of railways from the ports to the mining centres. When the first flush of mining activity had subsided, the railways attracted settlers, who proceeded to develop suitable land in the vicinity. In Canada, a scheme of railway construction is being carried out to tap the resources of hitherto undeveloped parts of the country, and the same process is going on in Africa and South America. The Trans-Siberian railway, as we have seen, has opened up an enormous tract of Asiatic Russia for development. Here railway transport is the only suitable method as the new regions are so far from centres of population.

The value of railways (particularly light railways) in times of war is also a material factor to be taken into account and in many parts of the world railways have been constructed ostensibly for ordinary purposes but largely with an eye to their advantages from a military standpoint; *e.g.*, on the Indian frontier, between Italy and Austria and between France and Germany.

The course of a railroad is largely influenced by relief, and it may be stated as being a general rule that " railways follow the lines of least resistance ", *i.e.*, they make use of river valleys and coastal plains, and take advantage of gaps and passes when they have to cross mountain chains. Wherever possible, obstacles such as mountains, deserts, swamps and gorges are avoided, but the exigencies of commerce frequently necessitate the construction of railways in spite of physical obstacles. Hence, we find that, in different parts of the world, railways are constructed to ascend mountains; in tunnels bored through mountains (*e.g.*, the tunnels of the Alps); in tunnels under rivers (*e.g.*, the Severn Tunnel), and in iron tubes under towns (*e.g.*, London's " Underground "). The commercial factor also frequently necessitates a circuitous rather than a direct route so that as many important towns as possible can be linked up and the problem of return freight thereby solved. Political factors also influence railway construction, causing railways to be built in regions where the geographical and economic considerations would not justify the expenditure and labour involved, *e.g.*, the proposed French Trans-Saharan railway previously mentioned.

The Problem of Railway Gauges

Divided political control is largely responsible for differing railway gauges (*i.e.*, the space separating the two lines constituting the track) between countries and even between states in the same country. Such differences naturally increase transport charges owing to the necessity and cost of breaking bulk where the two gauges meet. In Australia, for example, where each State has developed its railways independently and regardless of a general uniformity of gauge, through traffic without breaking bulk is impossible on any long journey.

Railway gauges are classed as *broad, standard* and *narrow*. The standard gauge is 4ft. 8½ ins. All above this are broad and all below are narrow. The standard gauge is general in Great Britain and in all European countries with the exception of Estonia, Finland, Latvia, Ireland, Spain, Portugal and Russia. Ireland uses mainly the standard gauge, Asia Minor both the standard and narrow gauges. The United States and Canada have standard gauge, but in South America the broad and narrow gauges are more general, while the broad gauge predominates in the Argentine. In Australia (where the question of the standardisation of the gauges is under consideration) there are three gauges—3 ft. 6 in. and 4 ft. 8½ in. (standard) in New South Wales; 5 ft. 3 in. in Victoria and South Australia; and 3 ft. 6 in. in Queensland and Western Australia. New Zealand, South Africa and Japan each has the narrow (3 ft. 6 in.) gauge. India uses three narrow gauges (2 ft., 2 ft. 6 in. and 1 metre) and one broad gauge (5 ft. 6 in.), while Egypt has the standard and the 3 ft. 6 in. gauges. Ceylon, Spain and Portugal use the 5 ft. 6 in. gauge, and Russia a 5 ft. gauge.

Railway Motive Power

In the majority of cases the motive power of the railway is steam produced from coal. In America oil as a motive force was experimented with but proved to be unsatisfactory. The latest development is the use of electricity, which has proved entirely satisfactory and will probably displace steam power. In the larger cities, such as London and New York, where traffic is heavy over short distances, there are numerous electrically driven railways, and their use is being extended over longer distances. New routes, too, are being fitted with electric trains, as, for example, in Switzerland and Holland, where extensive and efficient electric systems exist, and in Czechoslovakia, which is rapidly developing her new routes on these lines. In Britain, the Report of the Weir Committee on Railway Electrification (1931) recommended the complete electrification of all British railways and steps in this direction will doubtless be taken in the near future. The power will be developed at huge generating stations near coal supplies, and will be distributed as required to the railway systems. In this way there will be a vast saving of fuel transport as well as a release for other purposes of rolling stock which is now used for moving coal.

THE WORLD'S CHIEF RAILWAYS

It is impossible in the space at our disposal to deal in detail with the railway systems of the world as a whole. Brief details only are given of the more important railways, with special reference to the transcontinental lines.

European Railways

Europe has a network of railways radiating from Paris and Berlin and connecting the ports and important towns of all the countries (*see*

Fig. 156 in Chapter 21). One notable feature is that no railway yet crosses the Pyrenees; the lines which link up France and Spain utilise the very narrow coastal plains at the two ends of the range.

The Orient Express route from Paris to Istanbul (Constantinople) and Salonika is an excellent example of the manner in which railways follow the lines of least resistance. From Paris the line utilises the valley of the Marne, crosses the Meuse and the Moselle to Nancy, and then runs through the Gate of Lorraine to Strasbourg in the upper Rhine valley. After crossing the Rhine, it follows the river north to Karlsruhe to avoid the Black Forest, whence it turns east, making use of the Neckar valley to reach Ulm on the upper Danube. The route continues to Munich, across the Inn to Linz where it enters the Danube valley, which it follows to Vienna—the most important railway junction in Central Europe. From Vienna the line follows the Danube valley east to Budapest and south to Belgrade. At Belgrade it leaves the valley of the Danube and utilises the Morava valley to reach Nish, whence the main line runs to Sofia and follows the Maritza and its tributaries to Istanbul (Constantinople). The line to Salonika runs from Nish up the Morava valley to the upper valley of the Vardar, which it follows to its terminus.

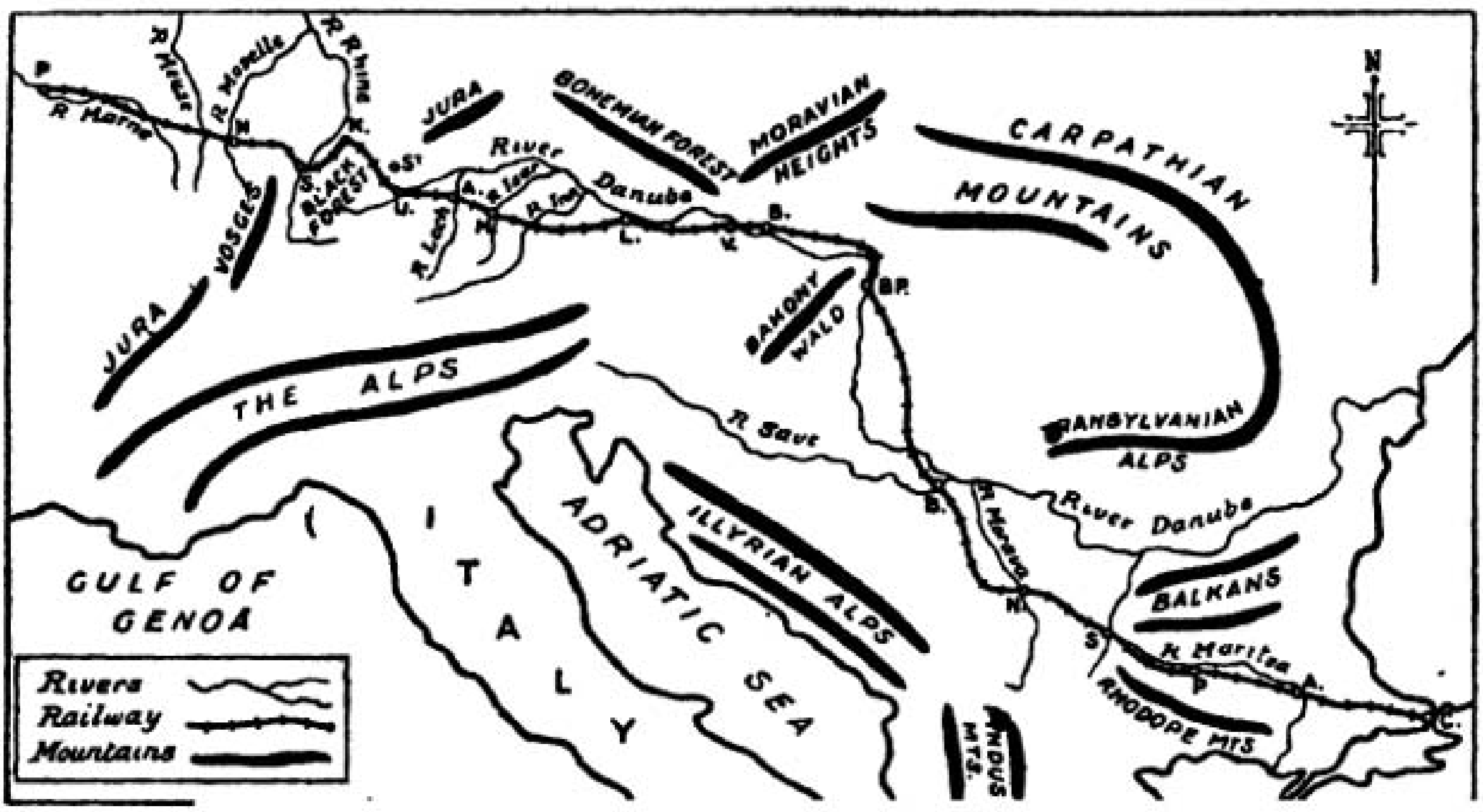


Fig. 142. Orient Express Route.

Paris is linked by railway (*a*) with all the principal French ports (Calais, Rouen, Le Havre, Cherbourg, Nantes, Bordeaux, and by the P.L.M. railway *via* the Côte d'Or to Dijon and down the Rhône Valley to Lyons and Marseilles); (*b*) with Switzerland and Italy—(i) *via* Dijon, Maçon, the Isère valley and *Mont Cenis Tunnel* to Turin, thence across the Plain of Lombardy to Bologna and down the narrow east coast plain of Italy to Ancona and Brindisi; (ii) *via* Dijon, the Col de Jougne (Juras) to Lausanne, the *Lötschberg* and *Simplon Tunnels* (Alps) to Milan, thence to Genoa, to Rome and Naples, and to Bologna and the east coast of

Italy; (iii) *via* Belfort, Basel and the *St. Gothard Tunnel* to Milan; (iv) *via* Dijon, Berne and the *Lötschberg* and *Simplon Tunnels* to Milan; (*c*) with Spain and Portugal by a line round the western end of the Pyrenees to Madrid and Lisbon; and (*d*) with Germany *via* Cologne and Berlin (*see* Fig. 124 in Chapter 16).

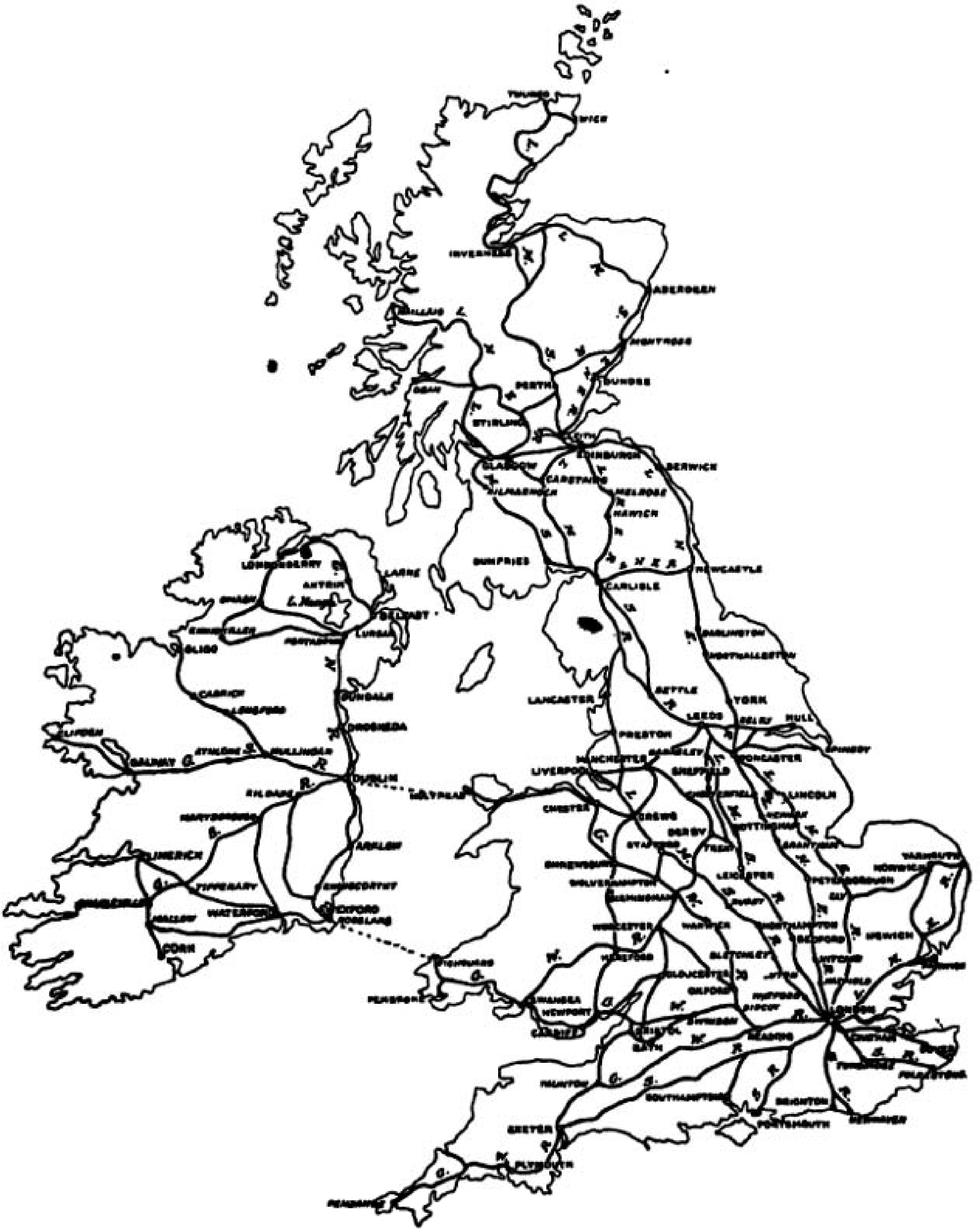


FIG. 143: THE MAIN RAILWAY LINES OF THE BRITISH ISLES.

BERLIN has lines radiating to Hamburg and Copenhagen; to Stettin and Danzig; to Vilna and Leningrad; to Breslau and Vienna; to Dresden and the Elbe valley to Vienna, and thence *via* the *Semmering Pass* to Trieste; to Liepzig, Munich, Innsbruck and the *Brenner Pass* to Venice;

to Amsterdam and Rotterdam; and to Cologne, Brussels and Calais (*see* Fig. 125 in Chapter 16).

VIENNA is connected with Berlin; with Cracow, Warsaw, Vilna and Leningrad; with Bucharest and Constanza; and with Cracow, Lemberg and Odessa (*see* Fig. 130 in Chapter 16).

MOSCOW is the centre of lines radiating to Samara (Trans-Siberian railway), Leningrad, Warsaw, Kiev and Odessa, the Crimea and Transcaucasia.

British Railways

The routes of the main British railways are shown in Fig. 143, which should be studied in conjunction with a physical map. The four great railway systems of Great Britain are (1) the London, Midland and Scottish Railway; (2) the London and North Eastern Railway; (3) the Great Western Railway and (4) the Southern Railway. Each of these has systems radiating from London, mainly in the direction indicated by the name; *i.e.*, the Midland system chiefly serves the midland areas; the Great Western radiates from London to the West; the North Eastern clings to the eastern side of the country, whilst the Southern serves southern England and carries millions of Londoners every day from their work in the City to their homes in the southern counties. In Ireland, the main groups are the Great Northern Railway and the Great Southern Railway. Further detail relating to British railways will be found in Chapter 24.

Asiatic Railways

Apart from India and Japan, railway development in Asia is very backward.

THE TRANS-SIBERIAN RAILWAY (*see* Fig. 174 in Chapter 26) runs from Cheliabinsk (the junction of lines from Samara) to Omsk on the Irtish, Krasnoyarsk on the Yenisei, Irkutsk at the southern end of Lake Baikal, and to Chita. At Shilka, a few miles east of Chita, the line divides. One branch follows the Amur and its tributary, the Assuri, to Khabarovsk and Vladivostok. The other branch runs through Manchuria to Harbin and Vladivostok as the Chinese Eastern Railway. From Harbin a line runs to Mukden, whence it is possible to reach Fusan (Korea), Port Arthur and Pekin. A line continues from Pekin to Hankow on the Yangtse and towards Canton at the mouth of the Si-kiang, opposite to which stands Hong-Kong.

BANGKOK is joined to Singapore by a line running the whole length of the Malay Peninsula.

SAMARA is connected with Tashkent and Samarkand, and the latter is also in rail connection with Krasnovodsk. A line runs from Novo

Nikolayevsk on the Trans-Siberian railway to Semipalatinsk, whence a track has been laid to Alma Ata and the Tashkent railway.

Istanbul (Constantinople) is joined to Aleppo and Mosul and, except for a short break near Mosul, to Baghdad and Basra at the head of the Persian Gulf. Aleppo is also linked with Beirut, Damascus and Medina.

The Caspian Sea is being joined by rail to the Persian Gulf. The northern section from Bendergaz on the Caspian to Sari, and the southern section from Shah on the Persian Gulf to Dizful, have already been completed.

Japan. The Japanese railways run mainly along the coasts owing to the relief, but in some cases the valleys are utilized to join the east and west coasts. In Hokkaido a line runs from Soya in the north to Asahigawa, thence along the Isikori river to Sapporo and Otaru, and finally to Hakodate in the south. From Asahigawa there is a branch to Tokachi and Nemuro. All the main ports on the east coast of Honshiu (Nippon) are connected by rail, the line running from Minato in the north to Mita, Tokyo, Yokohama, Osaka, Kobe, Okayama and Shimonoseki in the south. The principal line in Kiushiu runs from Moji in the north to Kagoshima in the south, with an important branch to Nagasaki.

India alone of all the Asiatic countries has anything like a " system " of railways (*see* Fig. 139 in Chapter 16). From Bombay the Western Ghats are crossed by the *Thalghat Pass*, and the line then runs *via* the valleys of the Tapti and Narbada to Jubbulpore and Allahabad. Another line crosses the Ghats by the *Bhorghat Pass* and runs *via* Poona and Sholapur to Raichur and thence to Madras. Calcutta is joined to Peshawar along the Ganges-Indus valley *via* Patna, Benares, Allahabad, Cawnpore, Agra, Delhi and Lahore, and to Madras by a railway running along the east coast. Bombay is joined to Calcutta *via* Bhusawal and Nagpur, and to Delhi *via* Surat and Baroda. A line runs from Calicut *via* the *Palghat Pass* to Madras. Karachi is in railway communication with Quetta, and with Multan and Lahore along the Indus valley.

African Railways

The " Cape-Cairo " Railway. The southern section of this railway starts at Cape Town and runs north to De Aar, Kimberley, Mafeking, Bulawayo, Wankie, Livingstone (Victoria Falls), Elizabethville, Bukama, and finally to its present railhead at Ilebo or Port Francqui (Belgian Congo), over 3,300 miles from Cape Town. The northern section commences at Cairo and follows the Nile to Aswan. Between Aswan and Wadi Halfa there is a break, and the railway then continues to Berber, Khartoum and Makwar.

East-West Route. Africa now has an east-west transcontinental railway, although strictly speaking the line consists merely of branch lines from the east and west coasts to link up with the southern section of the "Cape-Cairo" line. The route is from Beira in Portuguese East Africa to Salisbury and south to Bulawayo on the "Cape-to-Cairo" railway, which is utilised to Tenke in the Belgian Congo. Connection westward is then made by a line *via* Luao, on the boundary between Angola and the Belgian Congo, to Lobito Bay on the coast of Angola.

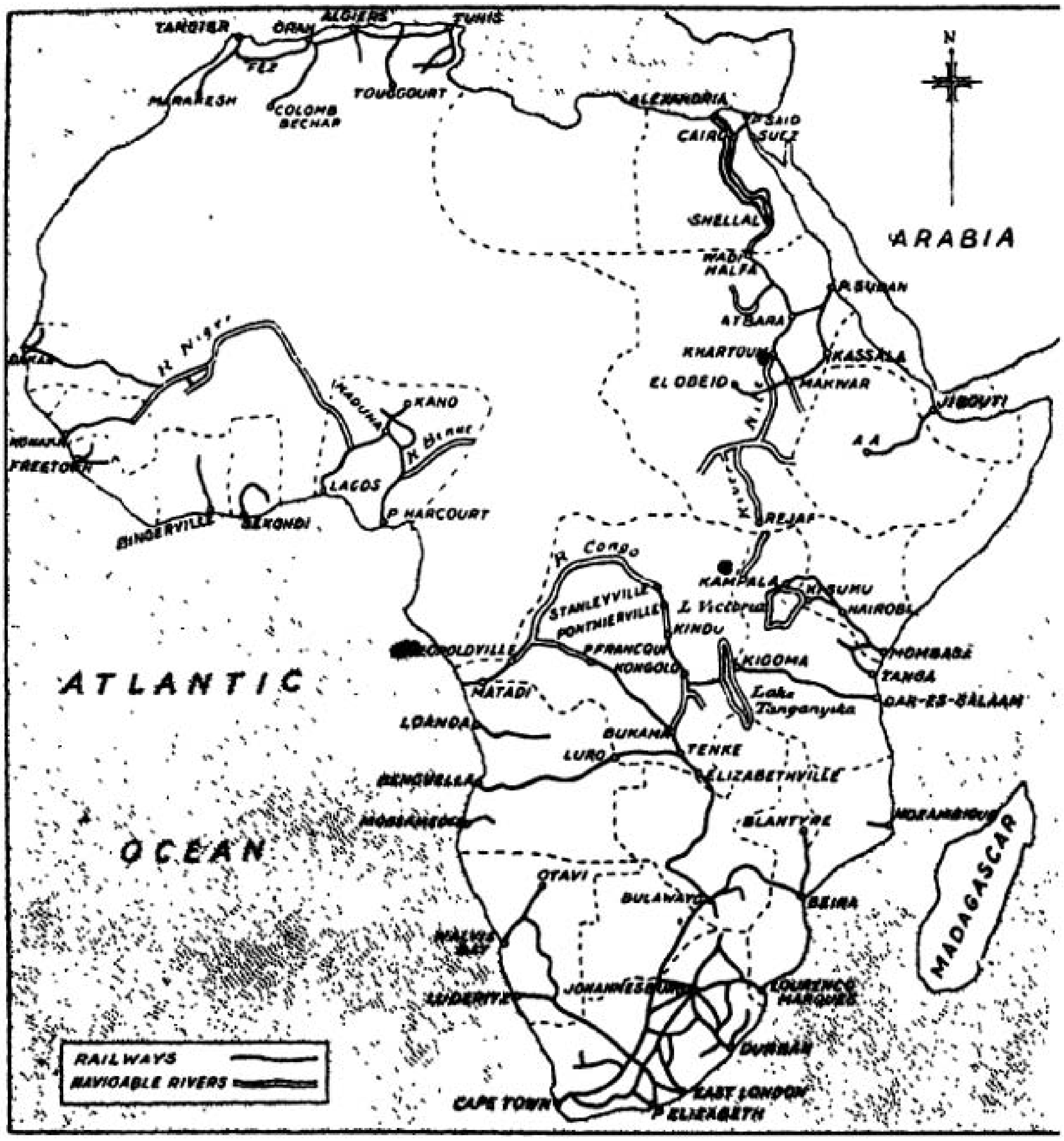


FIG. 144: THE MAIN RAIL AND RIVER ROUTES OF AFRICA.

Only the navigable parts of the rivers are shown.
Note the co-ordination between rail and river transport in certain areas.

South Africa has the most highly developed railway system of the Continent. Cape Town is connected with all the important ports and inland towns, and lines run inland from the ports to the mining and agricultural centres. Thus Cape Town, Port Elizabeth, East London, Durban and Lourenço Marques are all in communication with Kimberley, Bloemfontein, De Aar, Mafeking, Johannesburg and Pietermaritzburg.

A line runs from Dar-es-Salaam to Kigoma on Lake Tanganyika, and one from Mombasa *via* Nairobi to Kampala on the north-west side of Lake Victoria in Uganda, whilst a branch of this line runs from Nakuru, north of Nairobi, to Kisumu, on the north-east (Kenya) side of Lake Victoria.

The remaining African railways are short lines running inland from the coast or connecting adjacent ports. Morocco, Algeria and Tunisia are linked together by railway, and Nigeria has a line running north to Kano and N'Guru from Lagos, *via* Kaduna, and another line running from Port Harcourt to Kaduna. Port Sudan is joined to Berber, and to Makwar *via* Haifa, Kassala and Gederaf—the latter line serving the Gezira cotton area. The main railway routes of the continent are shown in Fig. 144.

Australasian Railways

Australia already has a west-east transcontinental line, while a north-south line is in course of construction. The west-east line runs from Perth in Western Australia, across the desert *via* Kalgoorlie to Adelaide, and thence to Melbourne and Sydney, with which all the important ports on the east coast are in railway communication. There is a network of railways only in the south-east, and, except for the

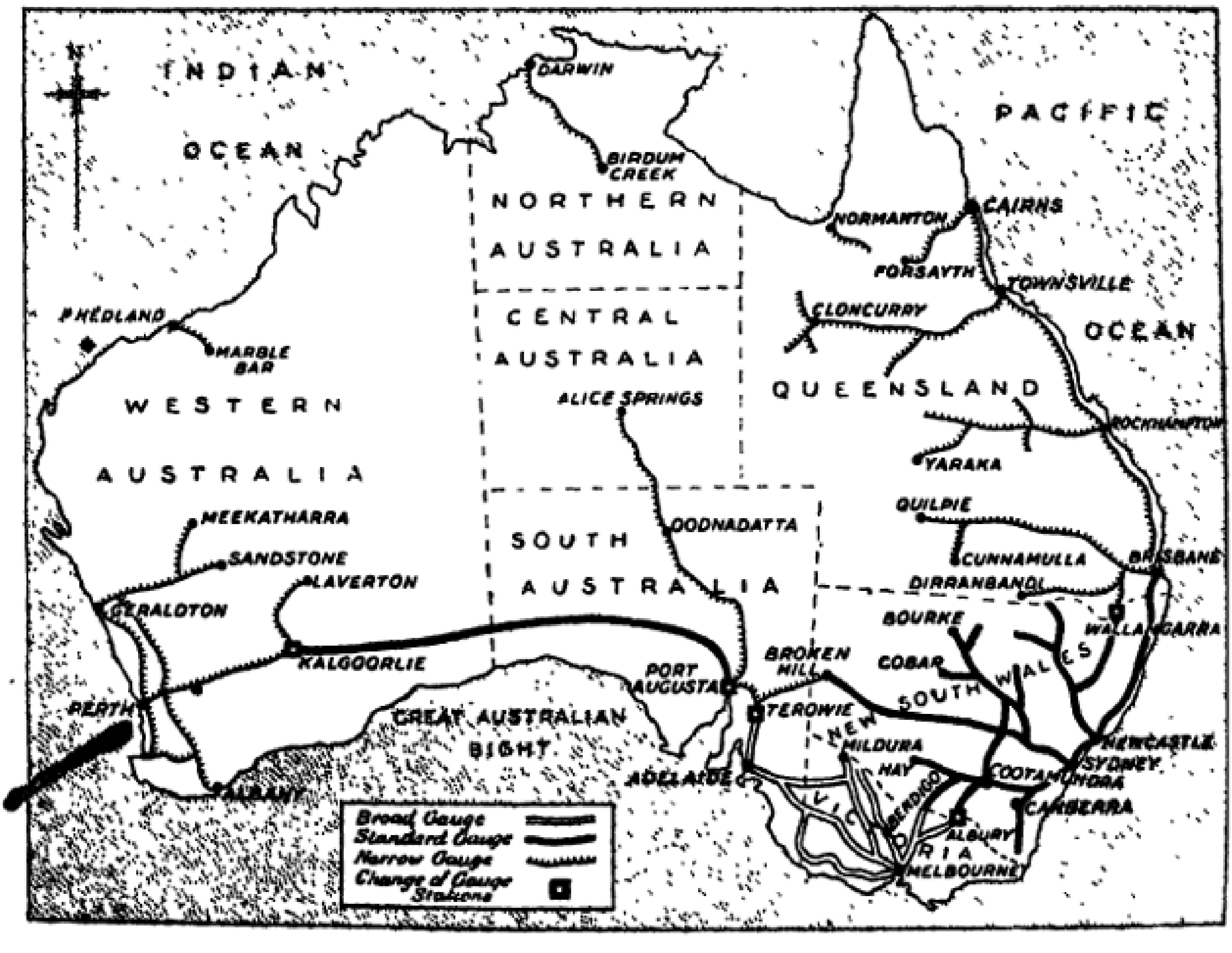


FIG. 145: THE PRINCIPAL RAILWAYS OF AUSTRALIA.

west-east line, the railways consist of short lines running inland from the coast to join the productive centres to the ports. The southern part of the north-south line is complete from Port Augusta *via* Oodnadatta to Alice Springs. The northern section runs from Darwin to Birdum Creek (near Daly Waters). Sydney and Melbourne are the principal railway centres.

NEW ZEALAND. In the North Island a line connects Wellington with Napier, on the east coast, and another line runs from Wellington to Auckland and Oakaihau. In South Island the principal line is the one running along the east coast from Invercargill, in the south, through Dunedin, Oamaru and Timaru to Christchurch. This line is connected with Greymouth, on the west coast, by an important line which crosses the Southern Alps by the *Otira Tunnel*. Refer to Fig. 186 in Chapter 28.

North American Railways

North America has a number of transcontinental railways, all running from east to west in spite of the fact that the Rockies and the Appalachians are two formidable barriers. There are in addition many smaller connecting lines, particularly in the United States, too numerous to be detailed here. The construction of the Canadian coast-to-coast railways has been of inestimable value in opening up the country and in the development of trade, whilst the great advance of industry in the United States would have been impossible in the absence of a progressive policy of railway building. The opening of the Panama Canal has to some extent lessened the importance of the transcontinental railways of the United States which, before the opening of the Canal, were the only effective means of communication between the developing regions of the east and west, for there were no alternative inland waterways or sea-routes.

CANADA. The Canadian railways are nearly all owned by two companies—*Canadian National Railways*, which is State controlled, and the *Canadian Pacific Railway*. There are three transcontinental lines, one operated by the C.P.R. and two by the C.N.R. The routes can be easily traced on an atlas with the help of the brief description given below.

The C.P.R. line runs from St. John, in New Brunswick, through Maine, in the United States, to Montreal. From here the line runs up the valley of the Ottawa river to Ottawa and on to Sudbury. Making a detour round Lake Superior, it reaches the Lake ports of Port Arthur and Fort William and then runs west to Winnipeg, the focus of Canadian railways. Continuing westward it crosses the prairies *via* Brandon, Regina and Medicine Hat, and then turns north-west to Calgary at the foot of the Rockies, which it crosses by the ***Kicking Horse Pass***. The line then descends to the valley of the Columbia, and after traversing the Selkirk and Gold Ranges runs *via* the South Thompson valley to the Fraser valley, which it follows to the Pacific terminus of Vancouver. An important branch of this railway runs from Medicine Hat to Lethbridge, through the *Crow's Nest Pass* to Fernie, and then turns north to rejoin the main line.

The main line of the C.N.R. runs from Halifax, keeping north of Maine, to Quebec and Montreal. Thence it runs to Ottawa, Port Arthur and Fort William, Winnipeg, Saskatoon and Edmonton, and crosses the Rockies by the *Yellowhead Pass* to reach its Pacific terminus, Prince Rupert, *via* the upper Fraser, the Nechaco, the Bulkley and the Skeena valleys.

The second Canadian National transcontinental line runs from Pugwash (Nova Scotia) to St. John, Quebec and Montreal, then south of the Canadian Pacific to the Lake ports and Winnipeg. It continues north of the main Canadian National line *via* Battleford to Edmonton, crosses the Rockies by the Yellowhead Pass, and utilises the North Thompson and Fraser valleys to reach Vancouver, its Pacific terminus.

THE UNITED STATES. The true transcontinental lines of the United States commence west of the Appalachians and run to the Pacific seaboard. These routes are connected to the east coast by trunk lines which, being of the same gauge (standard), provide through transport from east to west. The five main transcontinental lines with their connections eastward are :—

1. *The Great Northern*, commencing at Duluth, at the western extremity of Lake Superior, and running to Seattle on Puget Sound.
2. *The Northern Pacific*, from St. Paul and Minneapolis, to Seattle.

   These two routes are under one control, and connection is made to the east coast from New York, up the Hudson-Mohawk valley, and *via* Buffalo, Cleveland and Chicago to St. Paul ; or from New York *via* Philadelphia and the Susquehanna valley to Chicago and thence to St. Paul.
3. *The Union Pacific*, the first American transcontinental line, is part of the Southern Pacific system. It runs from Omaha to Cheyenne, crosses the mountains by means of *Evans Pass*, and continues to Ogden on Salt Lake, whence the main line runs to San Francisco (*via* the Great Basin and Sacramento valley). Branches run north to Portland (*via* the Snake and Columbia valleys) and south to Los Angeles (*via* the Spanish Trail). Connection eastward is made from Omaha *via* Chicago and Pittsburg to New York.

4. *The Atchison, Topeka and Santa Fé* runs from Kansas City to Santa Fé (New Mexico), across the Arizona plateau, and *via* the lower Californian valley to San Francisco. Eastwards the line is continued from Kansas City across the Mississippi to St. Louis, thence *via* the Potomac valley to Baltimore and Philadelphia.
5. *The Southern Pacific* connects New Orleans with San Francisco, keeping close to the Mexican border. From New Orleans a line runs north-east to Washington and Baltimore.

MEXICO has lines connecting with the United States system, and a transcontinental line running from Vera Cruz (Atlantic coast) to Tehuantepec (Pacific coast). In spite of difficulties in construction, the country has numerous smaller lines, but their value is lessened owing to the frequent occurrence of short breaks.

In CENTRAL AMERICA a railway from Colon to Panama connects the Atlantic and Pacific coasts.

South American Railways

South America is backward in railway construction, except in the Argentine, where there is quite a network, and in Chile. For the most part the lines are short routes connecting the principal ports with the productive agricultural and mineral areas lying inland. In some cases connection between the isolated railways is made by means of air services, whilst, as in the case of Africa, some of the railways have been constructed to supplement the river traffic (*see* Fig. 146).

There is only one transcontinental railway, that running from Buenos Aires over the pampas to the Andes, which it crosses by the *Uspallata Pass*, and whence it descends to Valparaiso and the Chilean lowlands by numerous tunnels. The great drawback of this line is that the necessity of employing a smaller gauge on the Andean section makes necessary a double transference of both passengers and goods.

THE ARGENTINE railways radiate from Buenos Aires, whence lines run to all the principal towns (*e.g.*, Bahia Blanca, Rosario, Jujuy and Corrientes) and to Uruguay (Fray Bentos and Montevideo).

IN CHILE all the principal ports from Iquique southward are connected by rail.

IN PERU the Oroya railway, which attains a height of 15,865 feet, joins Callao and Lima to Oroya and Huanuco.

IN ECUADOR there is only one railway of any importance, that connecting Quito, the capital, with its port, Guayaquil.

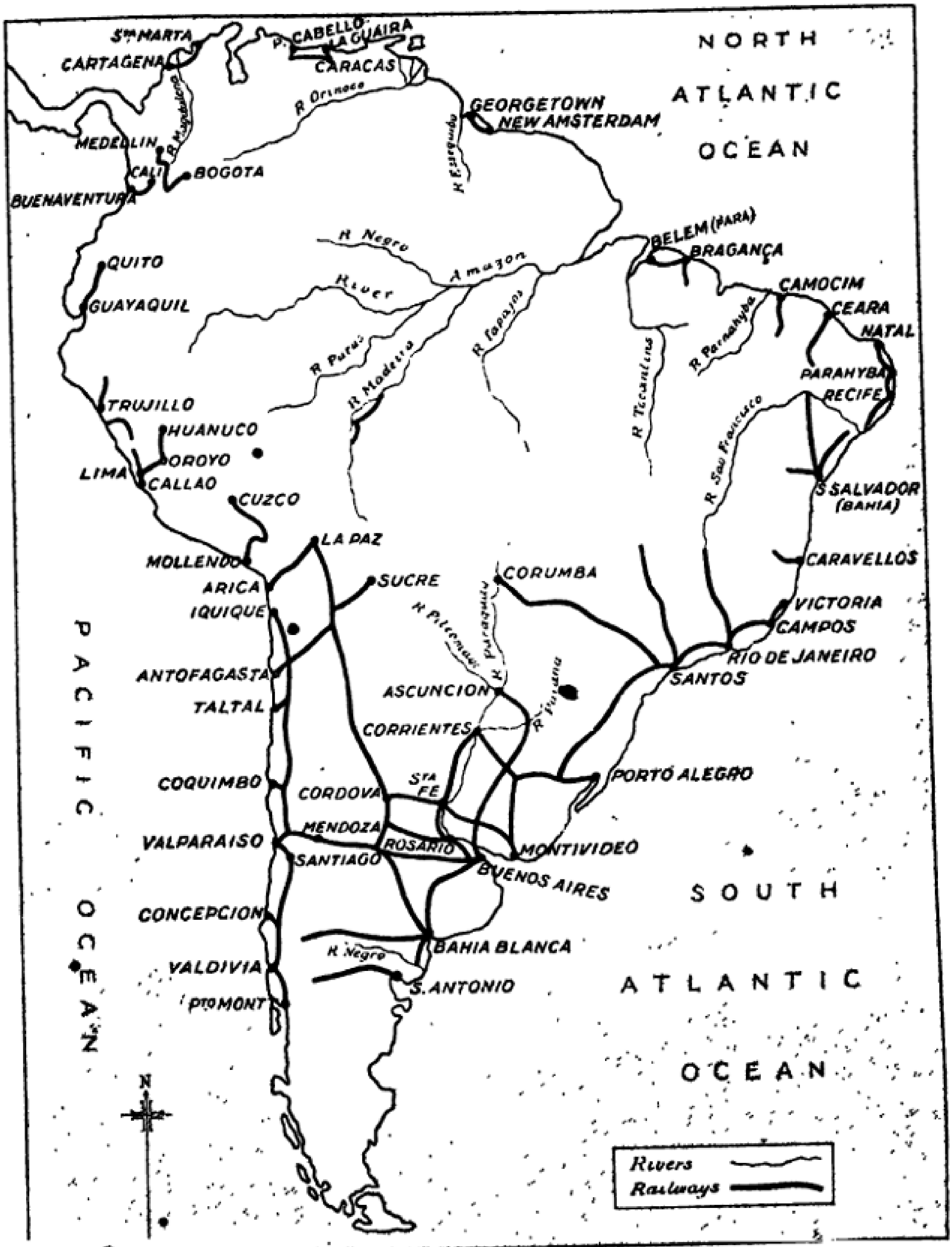


FIG. 146: THE MAIN RAIL AND RIVER ROUTES OF SOUTH AMERICA.

Only the navigable parts of the rivers are shown.

QUESTIONS ON CHAPTER 18

1. (*a*) Explain the importance of the Trans-Siberian Railway, and name the leading towns on its route.

   (*b*) Give a short description of the Trans-Continental Railways of North and South America. (*C.I.I. Associateship, Fire Branch,* 1931)

2. Describe a railway journey from London to Warsaw, mentioning the physical features, industrial districts and large towns. (*C.I.I. Associateship, Accident Branch,* 1932)

3. Draw a sketch of the so-called "Cape-to-Cairo railway" and describe the physical features of the country through which the railway passes. Indicate unfinished portions of the railway by dotted lines on your map. (*C.I.I. Prelim.,* 1931)

4. In what parts of the world are the following animals commonly used in the service of man: the elephant, the camel, the reindeer?

   Describe briefly the services which each renders, and point out the special qualities which make it suitable for these services and for the conditions of climate of the region concerned. (*C.S., Nov.,* 1931)

5. Indicate on a sketch-map the routes followed by any three railways across North America. Describe the human activities in the different regions through which *one* of the railways passes. (*L.M., January,* 1930)

6. In which countries are goods carried largely by (i) camels, (ii) mules, (iii) human porters? Explain why these modes of transport have been adopted in the countries you mention. (*C.S., April,* 1928)

7. Show the influence of geographical factors in helping to determine the route taken by one of the following railways: The Trans-Siberian, the Canadian Pacific, the European Orient Express. (*N.U.,* 1929)

8. Make a comparative survey of the routes from the east coast of the U.S.A. to the Mississippi Basin. (*C.W.B.,* 1927)

9. Write a geographical account of the railway route from Paris to Constantinople. (*L.M., Sept.,* 1933)

CHAPTER 19

INLAND NAVIGATION AND AIR TRANSPORT ; CABLES AND WIRELESS

INLAND NAVIGATION

ROUTES used for inland navigation are of two types—*natural* waterways, or rivers which are naturally navigable ; and *artificial* waterways, which include canals and canalised rivers. The so-called " sea " canals, such as the Suez Canal, Kiel Canal and the Panama Canal, are not included, for these, being navigable by ships of ocean-going size, are fundamentally different in character from the other types mentioned.

Canals

European canals are of comparatively recent origin, dating back only to the early 17th century. The first canal was constructed in France between 1604—1624, although it was not until 1761, about one-hundred and fifty years later, that the first important canal was built in England. The objects of canal construction are varied : to increase the utility of rivers and lakes by joining two rivers, connecting a river with a lake, joining two lakes, or circuiting rapids and falls on rivers and lakes ; to provide a means of transport across a stretch of country where no other method exists ; and to bring places " nearer to the sea," *e.g.*, the Manchester Ship Canal, which made Manchester into an important port accessible to ocean-going steamers. In recent years, too, canals have assumed importance in connection with the generation of water-power. Water for turbines is conducted along a certain course by means of a specially constructed canal, and the flow of water is then directed to a steep fall over which its volume is controlled by means of sluice gates and other mechanical contrivances.

The most important geographical consideration affecting the construction of canals is the relief of the land. An uneven surface is a deterrent, for it increases the initial cost by necessitating locks or very deep cuttings. Distance from navigable rivers or from the coast, on the other hand, will usually act as an incentive to canal construction if the character of the surface is favourable. Two important reasons for the lack of development of canals in Britain, for example, are, first, that no part of the country is situated at any great distance from a navigable river or from the sea; and, secondly, that the relief of the country militates against canal construction.

On the continent of Europe, where there are great stretches of level land and where the distance from the sea is sometimes very great, canals have been developed to a much greater extent, and are complementary to, and not in substitution for, navigable rivers and other forms of transport. This position, again, is in clear contrast to the position in Britain, where the canals have always been in direct competition with other modes of transport. To be successful, canals must have inland harbours, docks and efficient means of transferring goods from or to the other means of communication. These essentials are lacking in Britain, where the canals have no organisation similar to that of railways for the collection and delivery of goods, and so depend a great deal upon other means of transport for bringing traffic to them or for taking goods to the end of their journey.

The two important physical factors in relation to canal construction are the available water supply and the gradient of the canalised country. In Germany and Belgium all the water is supplied naturally and the average fall per mile is 3½ feet and 4⅓ feet respectively, with resultant economies both in lock construction and in lock dues. In France six-sevenths of the water supply is natural, the remaining one-seventh being supplied by compensating reservoirs. In England and Wales 43 per cent. of the water is artificially supplied and the average fall is 6 feet, two factors which are serious obstacles to the deepening and widening of British canals, and which operate to keep down the size of the barges used on canals in this country.

In Britain, the canal barges can carry only small quantities at a time because they must be small enough to pass easily along the comparatively narrow canals, to pass under the bridges and to pass through the locks. Only 40 per cent. of the canals of England and Wales have locks of more than 14 feet in width, and even these canals are separated by canals of smaller capacity. The standard barges in this country are seven feet (carrying 30 tons) and fourteen feet (carrying 60 tons), yet only the smaller of these can pass in all parts of the "canal X" (*i.e.*, the system of canals linking the Mersey to the Thames and the Trent to the Severn, which has roughly the appearance of a letter "X"). These figures compare most unfavourably with those of other countries where canals are used. In France the barge capacity is 300 tons (or 450 where France is linked to the Rhine); in parts of Belgium it is 800 tons; in Germany west of Berlin 600 tons, and east of Berlin 400 tons.

It is frequently stated that canal transport is cheaper than transport by rail, and while this may be generally true for long journeys, it is by no means universally the case. If the points of loading and discharge are on the waterside and no added services are necessary, the actual cost of transportation will be lower by canal than by rail; but if cartage to and from the waterway is necessary, involving additional cost in collection and delivery, the advantage of lower transport charges may be entirely lost. Payment of tolls, too, tends to lessen the advantage, while the slowness and irregularity of canal transport must also be set off against its apparently low charges. The advent of the motor barge has brought an improvement in this respect, but even yet the speed of movement cannot be compared with that of the railway or of the road.

Canals are most useful for transporting bulky materials which do not deteriorate with slow transit, such as coal, ore, salt and timber ; but even for such purposes they are remunerative only when they run through industrial districts. Other disadvantages of canals are that they serve only limited areas, are useless for hilly districts, and in winter are liable to be blocked by ice.

Rivers

Navigable rivers form a natural and easy means of communication between the sea and the interior of a country and afford a safe as well as a convenient anchorage for ships. The valleys of rivers, too, are of great importance as natural routes for railways and roads. As a result of such factors, combined with the advantages of ample water supplies and, usually, the fertility of the surrounding districts, nearly all the important towns of the world have arisen near large rivers—in many cases at the head of navigation of a river estuary ; for example, London at the head of the Thames estuary ; Albany at a similar point on the Hudson river ; the " Fall Line " towns of eastern U.S.A. ; Lincoln and York ; Rouen ; and Montreal.

The actual cost of river transport is cheaper than that of transport by rail, but as river transport is also much slower and more irregular, and the transport of goods by such means frequently involves a breaking of bulk, much river traffic has been diverted to the railways and, latterly, to the roads. Consequently, river transport assumes its greatest economic importance in those countries which are in a backward state of development, such as China and Siam. In some instances, the importance of a river as a method of transport is much increased by canalisation, which may be used to avoid falls, rapids or weirs, or to feed the main river with traffic from the surrounding districts. This is particularly true of the rivers of Continental Europe.

The great rivers of the world were established as highways of commerce hundreds of years ago. Some of them still retain much of their old importance, but many of them, like the canals, have become less important as means of transport with the advent of the railway. Before the construction of locks and canals, transport by river was restricted to those stretches of water which were unobstructed by rapids and falls, so that any river free from such obstruction and running through a productive area became a highway of commerce. In India, for example, the Ganges and the Indus are navigable by small vessels as far as the foot-hills of the Himalayas, and the Brahmaputra is navigable almost to the borders of Assam. For centuries, therefore, these great rivers were important highways of commerce, but now they are not used for transport to anything like the same extent as they used to be, since trade has migrated to the network of railways constructed in their valleys. In the Ganges delta and along the Brahmaputra and Irawadi (Burma), however, a large trade is still carried on by river.

There are, of course, quite a number of factors which may render a river quite unsuitable for transport purposes. It may not be sufficiently deep; it may be continually silting up, and thus require constant dredging; it may be obstructed by falls and rapids, and thus demand expensive locks and canals; it may be frozen over by ice during the winter, so that ice-breakers will have to be utilised; or it may be spanned by low bridges (as in the case of the Severn). But in none of these cases will the improvements be carried out unless there is a prospect of an adequate return for the outlay. Some rivers, excellent from other points of view, flow to inland lakes instead of to the sea, or away from the traffic centres and industrial areas, whilst others flow in deep gorges or cañons. Such rivers are usually of little value as means of transport.

Lakes

Lakes as a means of transport rarely assume far-reaching importance, their utility as a rule being purely local. Outstanding exceptions are the Great Lakes of North America, to which reference will be made later.

INLAND NAVIGATION IN THE VARIOUS CONTINENTS

EUROPE

Great Britain

Great Britain has no rivers which are navigable for long distances by ships of any size. There are, however, a number of rivers which have short navigable stretches and these were long used for inland trade. With the coming of the Industrial Revolution, the canals which were developed either superseded the rivers entirely or worked in co-operation with them, but at present most of Britain's inland water transport makes use of the principal canals. River transport is still important only along the lower reaches of certain important rivers, such as the *Thames*, the *Tyne*, the Bristol *Avon* and the *Clyde*, and even these have continually to be dredged to enable ships to pass inland to the river ports. The river *Trent* is utilised to transport the bulkier products of the Nottingham area to the ports of the east coast, and the *Weaver* to take Cheshire salt to the Mersey. The upper reaches of the larger rivers—the Thames, the Severn and the Clyde—are also used by barges, though not to any appreciable extent.

British canals are of two types—barge canals and ship canals. The former are of little importance, and there are only three ship canals of any great importance. Of the latter, the *Manchester Ship Canal*, 35 miles long, comes easily first. By it, ocean-going ships up to 11,000 tons can reach Manchester, and the city has thereby become an important inland port.

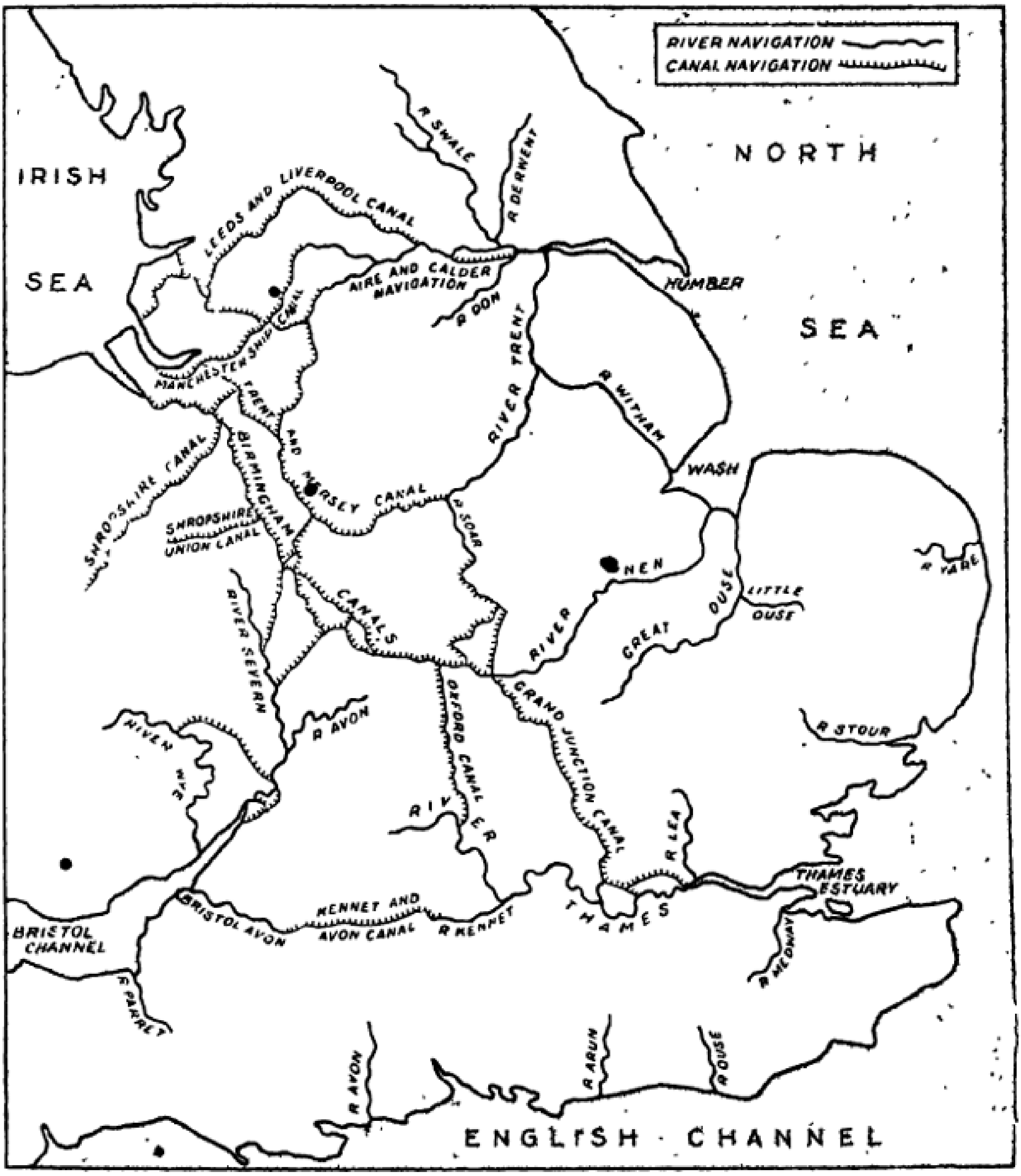


FIG. 147: NAVIGABLE WATERWAYS OF ENGLAND.

Only the navigable parts of the rivers are shown. (N.B.—The name "*R. Ouse*" should be marked on the Yorkshire Ouse which flows southwards to the Humber from its confluence with its tributary the *Swale*.)

About 33 per cent. of the British canals are controlled by the railways, and, largely for this reason, the canals and rivers in many parts of the country are practically derelict from the point of view of transport.

The geographical reasons for this lack of canal development have already been touched upon. The fact that no part of the country is far from navigable water tends to promote coastwise traffic in preference to inland navigation, while the excellent system of roads with which the country is provided gives canal and river traffic very little chance to develop. Most important of all, the railways, with their greater speed and certainty and their clockwork organisation, have attracted the bulk of the traffic from the canals and left to the latter only the transport of bulky materials of low value which cannot bear heavy transport costs.

Western and Central Europe

Many rivers of great commercial value flow through Central Europe into the Baltic and North Seas and through Western Europe into the Bay of Biscay. These are supplemented by a network of canals which are generally of excellent construction and kept in a first-class state of repair. The German canals were nearly all constructed by the State, while many other European canals are State subsidised. In France, in 1879, the Government purchased all but a few miles of canals, and has since prevented free competition between canal and railway transport by fixing railway rates 20 per cent. higher than canal rates.

The *Seine* is navigable by small ocean steamers as far as Rouen and by smaller craft up to Paris and even as far as Troyes. The *Burgundy Canal* connects the navigable part of the Seine with that of the Rhône by means of the Yonne and Saône, while the *Marne and Rhine Canal* unites the Seine navigation with that of the Rhine. The Seine is also connected by canals with the Somme, the Scheldt, the Meuse and the Loire. The *Loire* is navigable to Nevers, and is connected by the *Canal du Centre* with the Seine, the Rhône and the Saône. The *Garonne* is navigable to Toulouse and is connected by canal with the Rhône and by the *Canal du Midi* with the Mediterranean. The *Rhône* is the only important French river which flows into the Mediterranean Sea. It is navigable to Lyons, and is connected by canals with the Rhine, the Seine, the Loire and the Garonne, but, owing to the presence of sandbanks which impede its course and the existence of currents, communication with the Mediterranean is chiefly by canals, of which the most important is the *Marseilles-Rhône Canal.* The *Saône,* the tributary of the Rhône, is navigable almost from its source to Lyons, and is connected by canal to the Seine, and by the *Rhône and Rhine Canal* with the Rhine. The *Somme,* the *Oise,* the *Sambre* and the *Meuse* are all connected with one another by canal.

The *Rhine* is navigable for small ocean steamers to Mannheim and to Frankfurt on the Main. Vessels of 400 tons can reach Strasbourg and the absolute limit of navigation is Basel. In addition to the Rhine Canal connections already mentioned, the *Dortmund-Ems Canal* enables vessels of 750 tons to reach Dortmund from Emden. Apart from its great value as a highway of commerce the Rhine is also important politically, being for a large part of its course the boundary between France and Germany, and between Switzerland and Germany. The *Weser* is navigable for large vessels to Bremen and for small vessels to Cassel. The *Elbe* is navigable for large vessels to Hamburg and for vessels of 400 tons to Prague. It is linked to the Baltic by the *Kiel Canal* and the *Elbe-Trave Canal*, and is also joined with the *Oder*, which is navigable to Breslau and thence to Kosel by canalisation. Hanover is linked by the *Mittelland Canal* to the Dortmund-Ems Canal.

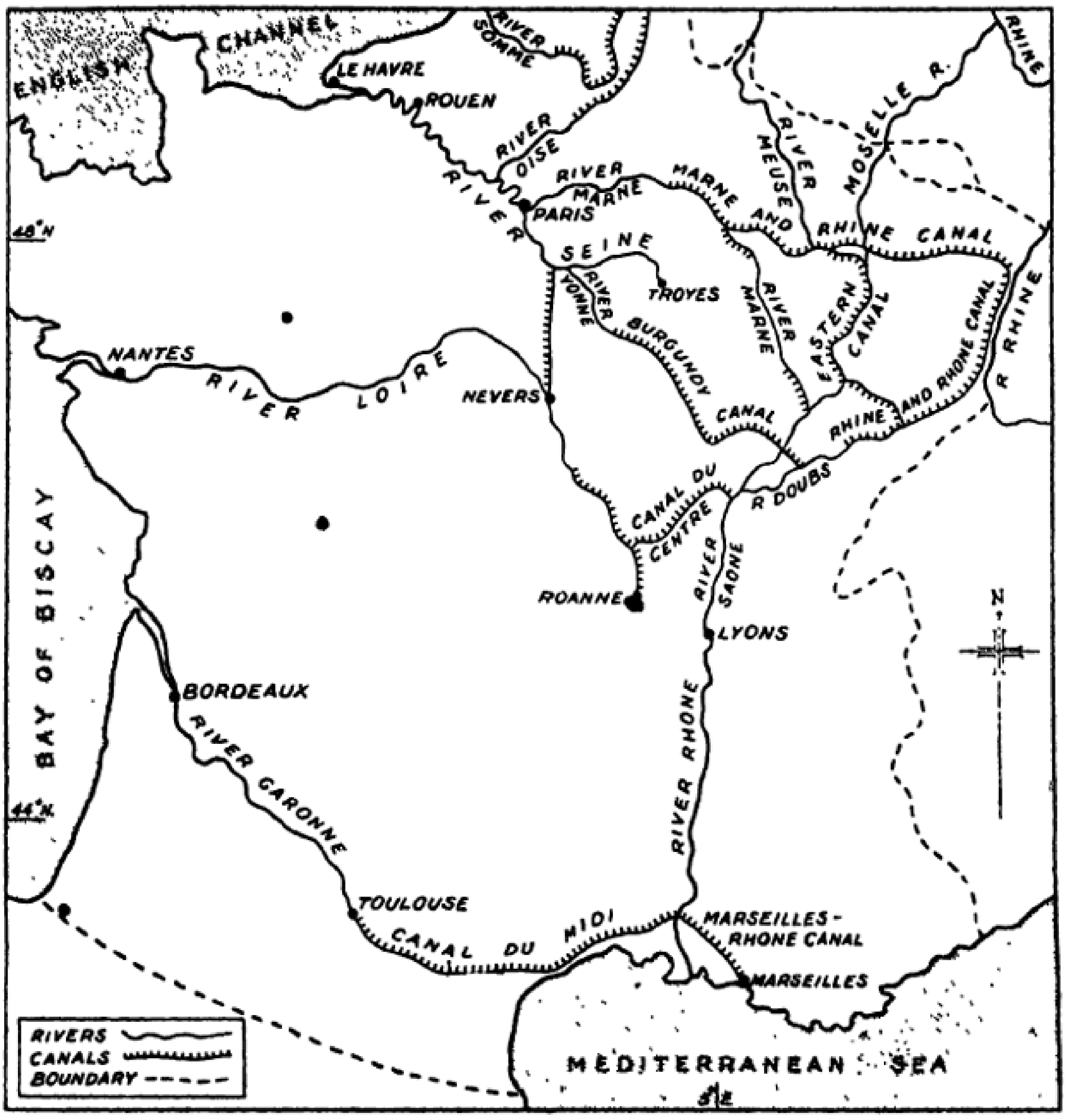


FIG. 148: THE NAVIGABLE WATERWAYS OF FRANCE.

Only the navigable parts of the rivers are shown.

The *Danube* is navigable to Braila for ocean-going vessels, to Ratisbon for 400-ton vessels, and to Ulm for smaller craft. Its tributaries—the Save, the Drave and the Tisa—are also navigable for considerable distances, and the Ludwig Canal gives access to the Main, the Rhine and the Rhône. As the Danube flows into an almost enclosed sea and is not directly connected with any large industrial areas, it is only of local importance although it carries a large traffic. By the Treaty of

Versailles the river was internationalised, and this guaranteed freedom of navigation and equal treatment to the ships of all nations.

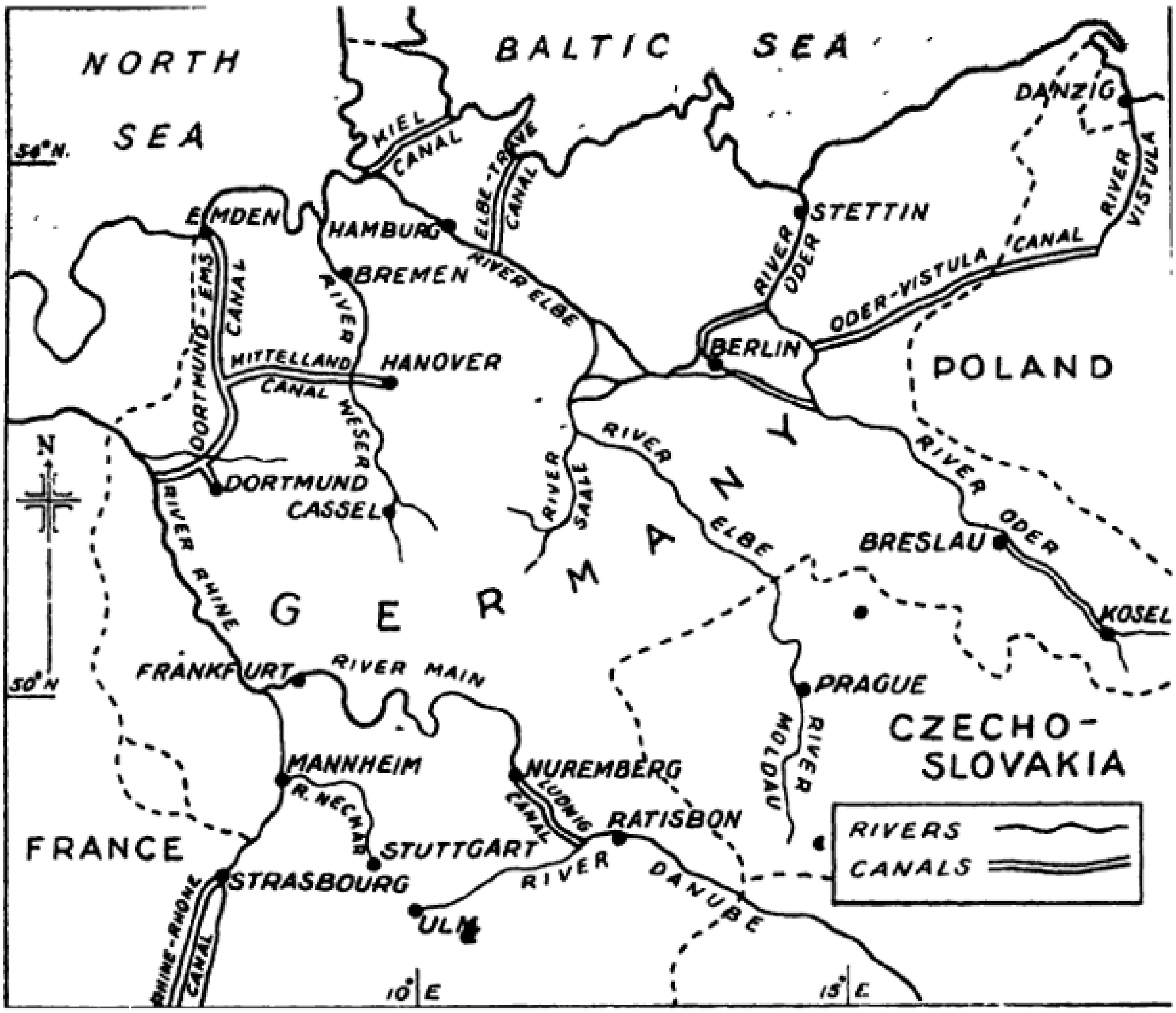


FIG. 149: THE NAVIGABLE WATERWAYS OF GERMANY.
Only the navigable parts of the rivers are shown.

Eastern Europe

The *Volga*, the longest river in Europe, is very slow flowing, and, like all Russian rivers, has the serious disadvantage from the transport point of view of being frozen in winter. In summer, however, the river is of great value as a means of communication.

The Arctic and Black Sea rivers are of comparatively little value for navigation purposes, the former being frozen for many months, and the latter being obstructed by shallows; but the Baltic rivers—the *Neva*, the *Dwina*, the *Niemen* and the *Vistula*—are of great commercial importance. The Vistula is navigable throughout most of its course, and is connected with the Oder by canal. The White Sea is connected with both the Baltic Sea and the Black Sea by rivers and canals.

The Peninsulas

The rivers of the Scandinavian, Balkan and Italian peninsulas are of little use for navigation owing to their rapidity and their varying depths. The Iberian Peninsula has many long rivers, such as the *Douro*, the *Tagus*, the *Guadiana*, the *Ebro* and the *Guadalquivir*. All except the Ebro flow west, but they are navigable only for a short distance from their mouths.

ASIA

River navigation is a very important means of internal communication in Asia. On the northern plain of Siberia the rivers are navigable for immense distances during the summer months, but they are of local importance only. The reasons for this are that they are frozen for the greater part of the year, that they flow chiefly through barren country, and that they empty themselves into the Arctic Ocean, which is always encumbered by ice even when it is not actually frozen.

Their chief use is as feeders to the Trans-Siberian railway, and towns are developing on their banks at the points where the railway crosses (*e.g.*, Omsk and Krasnoyarsk).

China

Some of the Chinese rivers are navigable for hundreds of miles, and river transport is highly organised. Canals, too, are of importance, farmers frequently having their own canals on which to take home their crops. The *Amur*, on the boundary between Siberia and Manchuria, is navigable in the summer months. The *Hwang-ho* (Yellow River), the chief river of northern China, is a fast-flowing river and has an upper course impeded by rocks and a lower course impeded by shallows. It is therefore not very important as a means of transport. The *Si-kiang*, the chief river of southern China, is very important as a means of transport, which is carried on mainly by motor-boats. The river is navigable almost throughout its whole course, although rapids impede progress in some parts.

The *Yangtse-kiang*, the longest river of China and the most important in eastern Asia, flows through some of the most fertile and densely populated parts of China, and is also of great value as a means of transport and communication. The river is navigable by ocean-going steamers as far as Hankow, a distance of over 600 miles, whilst river steamers can ascend for a distance of 1,000 miles to Ichang. Above that town for about 120 miles navigation is frequently impeded, even for small boats, by falls and rapids, but onwards the river is navigable to beyond Chungking.

India and Burma

The *Ganges*, the principal river of India, is navigable to the Himalayan foothills. Its valley contains a network of navigable canals, and the river has many tributaries which also are navigable, the most important being the *Jumna*. The western mouth of the Ganges delta, the *Hooghly*, is the great channel of ocean navigation to Calcutta.

The *Indus* is navigable to the gorges that extend to the confluence of the Kabul River near Attock, but owing to the shifting sandshoals in its bed, navigation is difficult and the river is of very slight commercial importance. Its waters are used, however, to feed numerous irrigation canals which are used for transport also. The most important tributaries of the Indus, the *Sutlej* and the *Jhelum*, are both navigable for a considerable distance.

The *Brahmaputra* is an important means of communciaton and is navigable almost to the border of Assam. The *Deccan rivers* flow in deep gorges as a rule, and, except for the sections which traverse the coastal plains, are useless as a means of transport.

The *Irawadi* is the most important river of Burma and is the main artery of commerce in the country. It can be navigated by steamers as far as Bhamo, over 900 miles from the sea. The *Chindwin*, its chief tributary, is navigable for 300 miles.

Iraq and Indo-China

The *Euphrates* and the *Tigris*, which unite and flow into the Persian Gulf, are the only important navigable rivers of south-western Asia.

In Indo-China, the most important inland navigation route is provided by the *Mekong*, which is navigable for several hundred miles, but is considerably impeded by rapids, particularly in its upper course.

AFRICA

Internal communication has always been extremely difficult in Africa, and large tracts of the interior have been almost inaccessible until comparatively recent times. One reason for this is that river communication is greatly impeded by falls and rapids. The great exception is the *Nile*, which is navigable without impediment from its mouth as far as the first " cataract " at Aswan, a distance of nearly 800 miles, while above the cataract it can be used by specially constructed steamers. The *Congo* is navigable between Stanley Falls and Stanley Pool, a distance of 1,000 miles, but, owing to the rapids formed in its passage through the west coast mountains, it has no direct communication with the sea. The *Zambesi* is navigable only in short stretches, continuous progress being impossible owing to the many rapids and falls. The *Orange* does not provide a direct route to the sea as there is a bar at its mouth, and its upper reaches are navigable only in the rainy season. The *Niger* and the *Benue*, which unite before reaching the sea, are not used by sea-going vessels as the delta is swampy and lagoon-like. They are, however, important inland as a local means of communication. (Refer to Fig. 144 in Chapter 18).

AUSTRALIA AND NEW ZEALAND

Owing to the general aridity of the continent, there are few useful waterways in Australia. In over 36 per cent. of the total area, water is lacking not only for transport but even for vegetation. The *Murray* and its main tributary, the *Darling*, are intermittently navigable for over 2,400 miles, but little has been done to extend this usefulness by such means as locks, while vessels are barred from the sea by sandbanks. At flood times, however, steamers can be operated 30 miles away from the main channel.

In New Zealand, the relief of the land gives the rivers short, rapid and generally much impeded courses. They are thus of little value for navigation purposes and, as in Britain, coastwise traffic is of much greater importance than inland navigation.

NORTH AMERICA

The most striking feature of inland navigation in North America is the vast system which comprises the Great Lakes, the St. Lawrence river and numerous connecting canals. This system stretches from Lake Champlain, between the New England States of New York and Vermont, to the Great Bear Lake in the North-West Territory. The most important of the lakes are the five Great Lakes draining into the St. Lawrence, *viz.*, Lakes *Superior*, *Huron*, *Michigan*, *Erie* and *Ontario*. By means of the St. Lawrence and connecting canals, it is possible for ocean-going ships up to 5,000 tons to reach Fort William, situated at a distance of over 2,000 miles from the Atlantic and within less than 2,000 miles by rail of Vancouver on the Pacific seaboard. Ships of 25,000 tons can travel 1,200 miles from the head of the Lakes to Kingston, at the eastern end of Lake Ontario, but, as these large ships are prevented by small locks of the St. Lawrence canals from reaching Montreal and the ocean, the traffic on the Lakes is mainly in the hands of specially constructed lake steamers, transhipment from and to ocean-going vessels being effected at Montreal.

The St. Lawrence and the Great Lakes, supplemented by the numerous short canals, form a system of internal navigation unparalleled in any other continent. The shortest and most important canals are the *Sault Sainte Marie* or " Soo" canals, by which the rapids between Lakes Huron and Superior are avoided ; and the *Welland Canal*, between Lakes Erie and Ontario, which avoids the famous Niagara Falls. On the United States side ships can reach Duluth, at the head of Lake Superior, 2,400 miles inland. The importance of the " Soo " Canals is outstanding, the tonnage which annually passes through them being enormous and being vastly in excess even of that which passes through the Suez and Panama Canals.

The remaining navigable lakes of North America all lie in Canada. They include the four large lakes of the Central Plain—*Winnipeg*, *Atha-*

baska, *Great Slave* and *Great Bear*, which will increase in importance as the northern lands are opened up—and Lakes *Kootenay*, *Arrow* and *Okanagan* of British Columbia, which have much summer traffic.

In addition to its fortunate possession of many navigable lakes, North America has several great rivers. Most of these drain the vast Central Plain. The *Mackenzie*, the *Nelson-Saskatchewan* and the *Red River of the North* are comparatively unimportant as they freeze during the winter, while the Nelson is too much obstructed by rapids to be of great service as a waterway. Attention has already been directed to the *St. Lawrence*. This river, despite its importance, has several drawbacks, such as the freezing of the estuary in the winter months, the great force of the current and the frequency of fog, especially at its mouth. The *Hudson*, with New York at its mouth, is navigable as far as Albany, from which point two systems of water communication diverge: (i) westward by the *Mohawk* river and the Erie Canal to Buffalo on Lake Erie; (ii) northward to the St. Lawrence by way of the *Champlain Canal*, joining the eastern extremity of the Erie Canal with *Lake Champlain*, and the canalised *Richelieu* river.

The *Mississippi* is navigable for steamers of considerable size to the falls of St. Anthony, within about four degrees of the northern frontier. The *Ohio*, the main left-bank tributary of the Mississippi, is navigable for six or eight months in the year as far as Pittsburg, the falls at Louisville being avoided by a short canal. Of the right-bank tributaries, the *Missouri* is navigable for over 2,000 miles, and the *Red* and *Arkansas* also are navigable for hundreds of miles. The Mississippi system therefore provides an important means of communication for central U.S.A. The less important rivers of North America—especially the *Yukon*, the *Peace*, the *Fraser*, the *Columbia* and the *Sacramento*—all provide useful routes for traffic.

SOUTH AMERICA

In South America, the *Amazon* is navigable for 2,600 miles to the foot of the Andes, and ocean-going steamers can travel direct to Iquitos, 2,300 miles up river. The Amazon has several navigable tributaries, many of which are suitable for steamers of moderate size. The chief is the *Rio Negro*. The *Orinoco* is navigable for 900 miles to the *Atures* cataract and beyond the *Maypures* cataracts it is navigable for an additional 500 miles. Like the Amazon, it has numerous navigable tributaries, such as the *Meta*, which is navigable to within 60 miles of Bogota. The three combined streams, *Parana*, *Paraguay* and *Uruguay*, which form the *Plate* are all navigable. The Parana and the Paraguay can be used for long distances by fair sized river steamers and they form a valuable means of bringing the products of the central regions to the sea. These and other navigable rivers are shown in Fig. 146 in Chapter 18.

AIR TRANSPORT

The purely geographical factors influencing the direction of air routes are relief, winds and fogs. The nature of the surface of a country may be an advantage or a disadvantage. Mountain ranges are a serious obstacle, though for reasons entirely different from those affecting land communications ; for whereas altitude is a serious disadvantage to the latter, it is not of such consequence for aircraft although there are disadvantages. First, there is the difficulty that the less dense atmosphere at high altitudes causes a loss of power and reduction in speed, which involve a higher petrol consumption than would otherwise be necessary. Then there are the difficulties of finding suitable landing places in mountainous country, and of safeguarding pilot and passengers against the intense cold experienced in high flying. But the most serious factor in this connection, and particularly for night-flying, is the danger which arises from the presence of winds and air currents, for air disturbances, such as air pockets and the great rush of air down the leeward side of a high mountain, are prevalent in mountainous regions and may cause the pilot to lose control temporarily.

Deserts act as a barrier, but do not present air transport with the difficulties experienced by land transport in such areas. In air transport the main drawbacks are the disturbance of air over the desert and the difficulty of finding suitable natural features by which to set a course, but otherwise flying conditions over deserts are unusually good.

The most disturbing factor on the air routes from London to the Continent is fog, but even the difficulties which arise from this can be overcome to some extent by means of wireless direction finding, whereby the pilot can call for his position as determined by bearings taken by wireless stations. The dangers from fog whilst landing can be similarly minimised, and can be overcome by providing alternative landing grounds so planned that one at least will always be clear of fog. The "ground organisation" of the air services has, indeed, been greatly advanced, particularly the meteorological section, for it has been realised that the regular running of an air line cannot be ensured in the absence of a carefully organised ground service, involving the provision of suitable aerodromes, emergency landing grounds, weather reports, directional wireless, wireless communication, route marking, aerodrome lighting and similar essentials.

Air transport, like all the other methods of transport, must pay, and it is therefore necessary that air routes should connect places of commercial importance. The shorter the route, the less is the advantage to be gained by the speed of air travel. This is one of the main reasons for the lack of development in Great Britain ; but in America and Eurasia, where there are great stretches of land to traverse, a great deal of time can be saved and it is here that the greatest advance has occurred. In the United States a transcontinental air route has been in operation for several years, but in Europe, whilst there are numerous routes in operation both on the Continent and from England to the Continent, the political factor has militated against the development of important international routes. The political factor is, indeed, a greater danger to the development of air routes than the geographical factors, for whilst the principal of the "freedom of the air," *i.e.*, that every country has a right to the air over its territory, is recognised, permission is required to fly over foreign territories, and owing to international jealousies this permission is not always granted. For example, the route of the service from London to India has been altered several times partly owing to differences of opinion with the Italian government.

Future Development

The bulk of the traffic on air routes at present comprises passengers and mails, both letters and parcels. A great disadvantage of air transport is that it is not yet possible to carry a paying load of merchandise, other than those which are of small bulk and high value, such as gold, precious stones and fine silks. Attention is therefore being directed to the possibilities of utilising airships for commercial purposes, while in another direction progress is being made in the construction of huge multiple-engined machines of greatly increased carrying capacity and horse-power. The possibilities of commercial air transport over large expanses of water will not be realised until a type of machine has been perfected which will be sufficiently reliable to brave the elements, to land if necessary on the water and ride out a gale, and to carry a paying load. Already, too, plans are in hand for a series of "seadromes" across the great oceans, anchored to the sea floor, and sufficiently high to be out of the reach of waves. On these a regular landing might be made by "marine air-liners" to take in supplies of fuel, although it is possible that, in the future, fuel supplies will be obtained during long journeys from ships stationed at suitable intervals in the oceans.

The development of airships for commercial purposes is still in the experimental stage, but, as the airship has a much wider radius of action than the aeroplane and can cover long distances without having to land, this form of transport is not unlikely to become of importance, particularly for transport across such wide expanses of ocean as those which separate Britain and North America, Australia and South America, South Africa and Australia, and Europe and South America.

In whatever direction development takes place, however, air transport has undoubtedly come to stay and as time goes on it will assume ever increasing importance. For long journeys it has an unqualified advantage over all other modes of transport—its speed. It is generally recognised that the maximum speed compatible with safety and economy has now been reached in the case of road and water conveyances; and, though the air services cannot in many instances compete with the steamship services, owing to the low cost of the latter, they will undoubtedly capture the mail and first-class passenger traffic and the traffic in costly goods, whilst the steamer and rail will continue to carry the heavier goods traffic and those passengers for whom speed is of less importance than cost.

EUROPEAN AIR ROUTES

Britain affords comparatively little scope for a highly organised internal air system, for, as we have already observed, air routes tend to be most useful and economical in large countries where time is saved by connecting industrial centres situated some distance apart. This is an important cause of the great development of airways on the European and American continents. As the world's air routes are so frequently altered and extended, it is impossible to give absolutely up-to-date information respecting the regular air routes in operation. The most recent information on the subject is given in the *Air Mail Leaflet* published by the G.P.O., and obtainable free of charge at any post office.

All the principal cities and towns in Germany and France are linked by air services, and lines also run from these countries to the principal cities of neighbouring states. The French services extend to North Africa and French Equatorial Africa, and by means of a steamship service across the South Atlantic, which is later to be replaced by a flying-boat service, Paris is closely linked to Buenos Aires. The network of air lines in Europe has undoubtedly effected a quickening in commercial intercourse, both internal and external.

The three main European air centres are London, Paris and Berlin. London has air connections with the principal continental towns and is the starting point of the Imperial air routes to the East and South Africa. The actual route of these services through Europe has been altered several times, but at present (1934) the Indian route consists of an aeroplane journey from Croydon to Paris, a train journey from Paris to Genoa (or to Brindisi in winter), a flying boat journey from Genoa or Brindisi to Athens and thence by aeroplane to Karachi *via* Alexandria, Cairo, Gaza, Baghdad, Basra, Bahrein Islands and Gwadar. From Karachi the route continues across India *via* Jodhpur, Delhi, Cawnpore and Allahabad to Calcutta, thence to Rangoon *via* Akyab, and to Singapore *via* Bangkok and Penang. The Australian section of this eastern service uses the Dutch East Indies and crosses the Timor Sea to Darwin in North Australia. A branch route leaves Karachi and serves Ahm[illegible]abad, Bombay, Bellary and Madras.

The most important air services from Paris and Berlin are:

1. *From Paris* to: (i) London; (ii) Cologne; (iii) Strasbourg, Prague and Warsaw; (iv) Basel and Zurich; (v) Lyons and Marseilles, with branches to Barcelona, Tunis and Algiers; (vi) Toulouse and French West Africa (steamer connection

to South America).

2. *From Berlin* to: (i) Hanover, Amsterdam, Rotterdam and London; (ii) Hanover, Cologne, Brussels and London; (iii) Munich and Rome; (iv) Vienna, Budapest and Belgrade and thence *via* Sofia to Constantinople and *via* Salonica to Athens; (v) East Prussia and thence *via* Riga and Tallinn to Leningrad or Helsingfors and *via* Kovno and Smolensk to Moscow; (vi) *via* Copenhagen to Oslo or Stockholm.

AMERICAN AIR ROUTES

The United States of America

The development of aviation in the United States has been greater than in any other country. There is a network of air lines connecting the principal cities and all are running regular services. The transcontinental lines run from New York *via* Cleveland, Chicago, Omaha, Cheyenne, and Salt Lake City to San Francisco; Philadelphia *via* Pittsburg, St. Louis and Kansas to Los Angeles, and Washington *via* Atlanta and Dallas to Los Angeles. Salt Lake City and Chicago are important air junctions, whilst lines run south to link up Mexico, Central America, the West Indies and South America. All the west coast ports are connected by air, and, from Chicago, a line runs north-west to Winnipeg. From Atlanta a service runs to Miami, then continues *via* the West Indies (Haiti, Porto Rico, St. Thomas, Antigua, St. Lucia and Trinidad) to South America, and *via* Havana to (*a*) British Honduras and western South America, (*b*) Kingston (Jamaica) to Colombia.

Canada

In Canada much use is made of aircraft for surveying hitherto unexplored land and also for assisting to keep in check forest fires which at times are disastrous. A transcontinental route is in course of preparation, and will run from Halifax *via* Moncton, Maine (U.S.A.), Montreal, Cochrane, Winnipeg, Regina, Lethbridge, Fernie (Crow's Nest Pass) to Vancouver, which already has air connection with Victoria on Vancouver Island. The existing lines, few in number, have been established to connect places difficult of access. Thus, there are lines from Montreal to Rimouski; from Sioux Outlook to Gold Pines and thence (*a*) to Narrow Lake and (*b*) to Red Lake; and from Peace River to North Vermilion (northern Alberta). In addition, there is the route which joins McMurray in north-east Alberta, *via* Resolution, Simpson, Norman and Good Hope, all in the Northern Territories, to Aklavik at the north of the Mackenzie River in the Arctic Ocean. This latter is the longest air route in Canada.

South America

There are already efficient local services linking up the majority of the South American Republics, and all the important towns of the continent will shortly be connected. Air transport has its greatest value in those states where railway development is not very far advanced. Thus in Colombia, Barranquilla is linked with Girardot and with Buenaventura, while branch lines run to Cristobal in the Canal Zone.

Air services as links in transcontinental routes from Peru and Chile to Brazil and Argentina have been established in Bolivia, and there are short regular routes operating from La Paz, with a longer route to Buenos Aires. Buenos Aires is connected with Santiago (Chile) *via* Rosario, Cordoba and Mendoza; with the more important towns of the Argentine; with the neighbouring states of Bolivia, Uruguay and Paraguay; and with Paris by the route already mentioned.

The east coast route from the United States continues from Trinidad *via* Georgetown (British Guiana), Paramaribo (Dutch Guiana), Para, Natal, Pernambuco, Bahia, Victoria, Rio de Janeiro, Porto Alegre and Montevideo to Buenos Aires. From here, a line continues south *via* Bahia Blanca and Rivadavia to Magallanes, the most southerly town in the world. The west coast route from the United States joins all the west coast ports as far south as Central Chile. The two routes from Havana join at Buenaventura in Colombia and the coast route then continues *via* Guayaquil, Trujillo, Lima, Arequipa, Iquique, Antofagasta, Caldera and La Serena to Santiago, the capital of Chile.

Natal, the port nearest to Africa, is the junction of a German service from Europe, conducted by seaplanes which call at a stationary ship halfway across the Atlantic. The French utilise fast steamers to connect their African and South American air routes.

AFRICAN AND AUSTRALIAN AIR ROUTES

Africa

There is great scope for the development of air routes in Africa, and the establishment of the Cape to Cairo air service should be an incentive to the development of branch lines to act as feeders to the transcontinental line. The African air route from London to the Cape utilises the existing section of the Indian route from Croydon to Alexandria and Cairo. From Cairo it continues *via* Assiut, Luxor and Wadi Halfa in Egypt; Atbara, Khartum, Kosti, Malakal, and Juba in the Anglo-Egyptian Sudan; Entebbe (on Lake Victoria) in Uganda; Kisumu (Lake Victoria), Nairobi and Moshi in Kenya; Dodoma and Mbeya in Tanganyika; Mpika and Broken Hill in Northern Rhodesia; Salisbury and Bulawayo in Southern Rhodesia; Pietersburg and Johannesburg in the Transvaal; Kimberley and Victoria West to Cape Town. From Cairo to the Cape is nearly 6,000 miles, and the route from Croydon to the Cape is the longest in the world. It seems probable that this air route will take the place of the proposed Cape–Cairo railway, since it is possible by air to achieve quite as effectively, more speedily and less expensively the object of that railway, *viz.*, the speeding up of communications between Cairo (and so Europe) and South Africa.

In East Africa there is a branch service from Nairobi to Mombasa, Zanzibar and Dar-es-Salaam. In the south, Johannesburg is joined to Durban, whence a route proceeds *via* East London and Port Elizabeth to Cape Town. There is also an air route from Kimberley to Windhoek in South-West Africa.

The French and Belgian colonies in Africa are linked with their respective mother countries, and there are several important local lines in operation, notably in the Belgian Congo, such as the routes from Léopoldville to Luluabourg (612 miles) and to Stanleyville (1,062 miles).

Australia

Aviation is proving of great value to the widely scattered settlements in Australia. Already over 4,000 air miles are in regular operation carrying passenger, mail and light goods traffic. The route northwards from Perth along the west coast (*via* Geraldton, Carnarvon, Onslow and Derby to Wyndham) is the only means of regular communication in that area apart from the coastal steamer service. In Queensland there is a service from Brisbane to Cloncurry with a continuation to Northern Australia *via* Camooweal to Daly Waters. From Cloncurry there is a branch to Normanton. Brisbane is also connected with Sydney while Adelaide is linked with Perth to the west and Melbourne to Launceston in Tasmania. Thus Australia is almost encircled by a series of regular air mail services in active operation.

CABLES AND WIRELESS

Cables

It is still less than a hundred years ago since the submarine cable first became of general practical importance. The first cable message was sent from England to France in 1851, and the first Atlantic cable was laid in 1866. After this date, the development of cable communication was phenomenal, for within a comparatively few years practically all the lands of the world were linked by submarine cables. Now there are in the world about 325,000 nautical miles of submarine cables, over sixty per cent. of the total being owned by British companies. The British "all-red" system is therefore of enormous importance; it has, indeed, been one of the most powerful factors in maintaining British commercial supremacy and in cementing the bonds of Empire. A study of Fig. 150 will show that British cables encircle Spain and cross the Mediterranean and the Red Sea. They link Egypt, In[illegible], and Ceylon, pass through the Malay Straits, and go north to China and south to Australia and New Zealand. They surround Africa and provide alternate lines to Asia and Australia *via* the Cape. They traverse the Atlantic through the Azores, to Canada, the West Indies and South America.

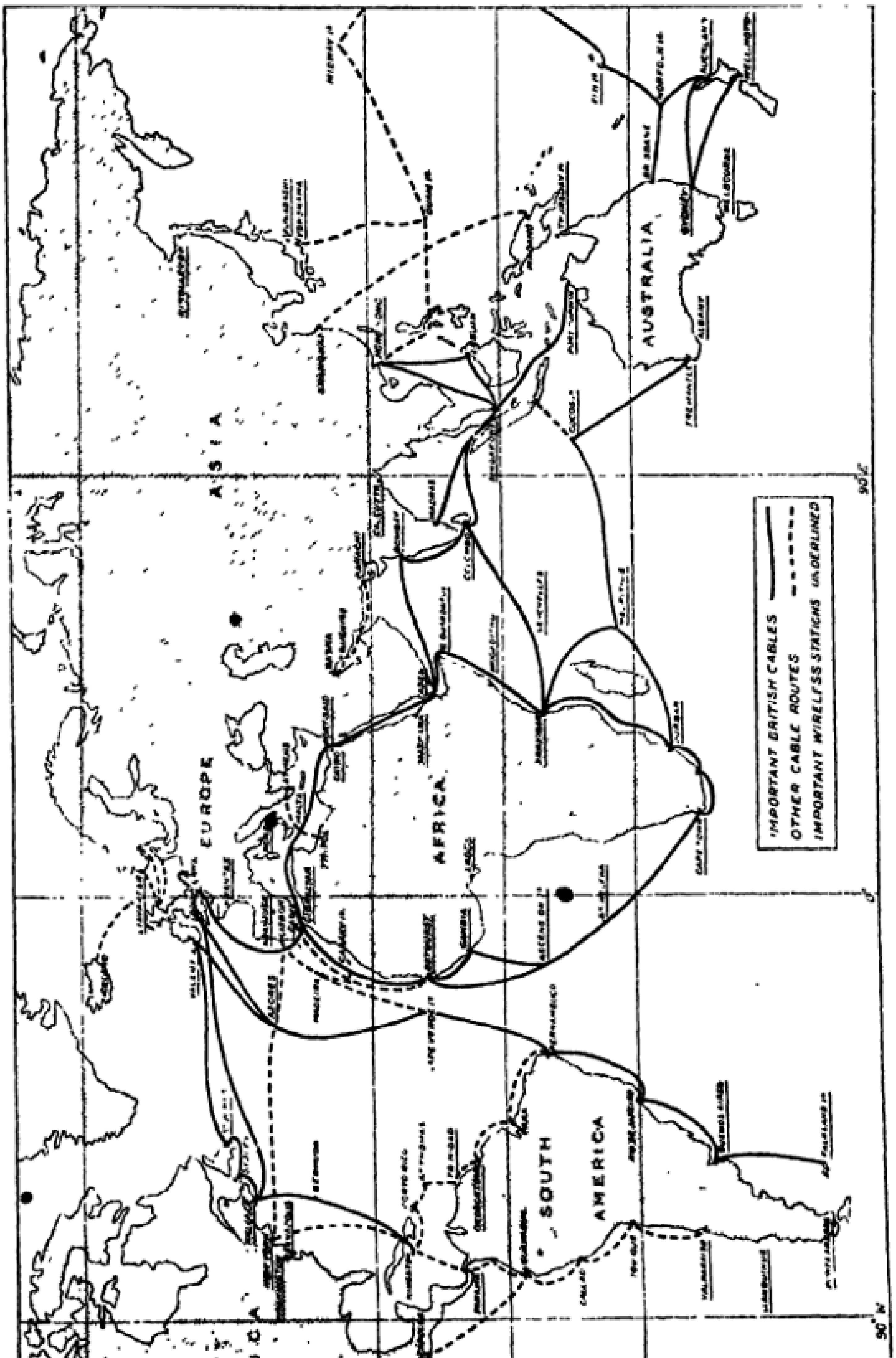


FIG. 150 : CABLE COMMUNICATIONS AND SOME LEADING WIRELESS STATIONS.

The advent of wireless telegraphy has to a certain extent lessened the importance of cable communication, but, by reason of the greater secrecy of the latter, it will never be entirely superseded by wireless. That cable communication is still of considerable importance is shown by the merger of all Imperial cable and wireless services under a single administration and subject to government control in a manner similar to that of public utility companies.

Wireless

" Although wireless is likely to have a marked influence on the development and extension of the cable and land-line system in the future, and may even in some cases supersede the latter, both systems are essential if we are to obtain full advantage of the implements of communication which science has placed at our disposal. The introduction of the motor car has not resulted in the scrapping of the tram lines. Nevertheless, it is an indisputable fact that had the motor car never been invented the tramway system would have been developed to a greater extent than has actually been the case. But what is far more important is that the additional facilities offered by motor transport have enormously increased the trading capacity of the world, thereby creating a still greater demand for transport facilities of all kinds.

" In the same way the introduction and perfection of wireless telegraphy have not resulted in, and are not likely to result in, the scrapping of the land line networks and cable systems of the world. But while it will undoubtedly influence the future extension of the cable system, by far the most important effect it will have will be to increase the trading facilities of the world."[1]

The development of wireless communication has proceeded rapidly since the first message was flashed across the Atlantic in 1902, and there are now a large number of wireless stations which provide direct communication between the various parts of the world. The comparatively recent invention of " beam " wireless, by which wireless messages may be concentrated in the direction of the receiving station (*i.e.*, along a " great circle "), has been revolutionary in its effects, for, by this method, high power stations are not required for transmission over long distances and the capital outlay required for the erection of stations has been markedly reduced. The erection of beam wireless stations has proceeded rapidly, and Puck's boast that he would " put a girdle round about the earth in forty minutes " would be a very poor boast to-day, for the peoples of widely separated countries of the world are now within a few seconds of hearing one another and the time cannot be far distant when they will actually be able to see one another.

Some of the more important wireless stations of the world are shown in Fig. 150. The wireless stations of Britain are not shown as they are too numerous. Such stations are situated at all the chief ports while other important stations are situated inland, *e.g.*, at Rugby and Daventry.

---

[1] *The Resources of the Empire; Communications*, by W. T. Stephenson.

QUESTIONS ON CHAPTER 19

1. Name the chief towns on the undermentioned Air Mail routes and the countries in which they are situated :--

   England to British East Africa.

   England to India.

   London to Oslo.

   London to Buenos Aires. (*C.I.I. Associateship, Fire Branch,* 1932)

2. (*a*) What do you know of the chief commercial submarine cables ?

   (*b*) Which air routes within the British Empire do you think best worth developing ? (*L.A.A. Prelim., June,* 1929)

3. Make out a list of suitable positions for aerodromes and repair depots for *one only* of the following proposed air routes :—

   (*a*) London to Calcutta ;

   (*b*) London to Cape Town ;

   (*c*) Berlin to Buenos Ayres.

   Give the country in which each is situated, with any reason—apart from its geographical position -which leads you to choose it. (*S.A.A. Prelim., May,* 1931)

4. Describe (with a sketch-map) the route you would follow in a flight (*a*) from London to Melbourne; or (*b*) from London to Pekin. (*I.C.W.A. Prelim., June,* 1931)

5. In some parts of Britain the manufacture of iron and steel goods is carried on at a considerable distance from a seaport, and the goods can be conveyed to the port either by road or by railway or by canal. What are the advantages and the disadvantages of each of these methods of transport ? (*C.S., September,* 1929)

6. "The future of Central Africa depends more on the development of road and railway transport than on river communications." Discuss this statement. (*L.M., June,* 1929)

7. In what ways do the North American natural waterways help in the development of that continent ? (*I. of B., Qual.,* 1930)

8. Give a brief account of the North American Great Lakes as a great inland waterway system. (*I. of B., Qual.,* 1926)

9. Indicate briefly the *geographical* considerations which must influence the way in which Inter-Imperial air transport is developed. (*I. of B., Qual.,* 1933)

CHAPTER 20

OCEAN TRANSPORT AND WORLD TRADE

OCEAN transport and world trade are complementary to one another. World commerce as we know it to-day would be impossible without the very efficient system of ocean transport which has gradually been built up and, conversely, without the great interchange of products which now takes place between the continents ocean transport services would not have reached their present high standard of efficiency. A good system of inland transport is essential to the economic well-being of any country, and particularly of such countries as the United States, which can command resources almost sufficient to make them entirely self-supporting. But to countries such as Britain, which has to import from overseas many of the necessaries of life and large quantities of raw materials for its important industries, ocean transport is of even more vital importance than inland transport. Indeed, this reliance upon distant overseas countries for the supply of important raw materials was the root cause of the growth and great strength of the British Navy and Mercantile Marine. Numerous merchant ships are needed to bring to our ports the goods we require and to take away from them the goods we send in return, while an efficient and adequate navy was necessary to ensure that, even in time of war, our ships could reach their destinations with their valuable cargoes.

The great difference between inland transport and ocean transport is that, whereas the former may be termed a " national service," ocean transport is necessarily an " international " service. Railways, for example, are on the whole solely concerned with the distribution of passengers and goods within the country which owns the railway, but ocean vessels carry goods from one country to another irrespective of nationality. Whilst, therefore, inland transport is vital to national commerce, ocean transport is vital to world commerce. Without it the variety of products of different regions of the world could not be exchanged at all in some cases (*e.g.*, the tropical products of the Amazon for the temperate products of Europe), while in others the exchange would be so difficult as to render the development of an extensive world trade impossible.

Ocean Carriers

The vessels utilised for the conveyance of goods across the oceans are divided into three main categories—(1) Liners, (2) Tramp Steamers and (3) Sailing Vessels.

Before the introduction of steam navigation, sailing ships were the only means of ocean transport, but now these fine looking vessels have been practically ousted from the seas. This is mainly because sailing ships do not depend, as do other types of vessel, on their own power. They are compelled to set their course so as to take the fullest advantage of the prevailing winds and ocean currents, with the result that the course of a sailing ship between two points is frequently much longer than the shortest route between those points. Moreover, the return journey of a sailing vessel is more often than not entirely different from the outward journey. The transport of goods by these vessels is therefore much slower than transport by steamers or by motor-driven ships. Sailing ship transport is, however, cheaper for certain cargoes—those of the cheap, bulky variety such as nitrate, wheat and coal—as the running costs are almost negligible compared with the running costs of a steamer.

Hence, although the day of sailing ships is almost past, and although their numbers are gradually diminishing, they are still used for the carriage of non-perishable, bulky goods where time is not very important and where the route lies in the track of the prevailing wind systems. For example, cargoes of wheat are still sent in sailing ships from Australia to England *via* Cape Horn. Occasionally, too, general cargoes of manufactured goods are sent in sailing ships from Europe *via* the Cape of Good Hope to Australia, whence the return voyage is frequently made from Newcastle (New South Wales), with coal for the western coast of South or North America. Nitrate may then be loaded from Chile and brought home round Cape Horn. The western coast of the Americas was formerly much visited by sailing ships, mainly for the reason that, except in British Columbia, the ports have no large coalfields in their vicinity from which steamers could be supplied. The opening of the Panama Canal has changed all this, however, and the western ports are now served mainly by steamers using the Canal instead of by sailing vessels using the Cape Horn route.

At the present time, therefore, ocean transport services are largely steamship services. Modern commerce demands speedy and reliable vessels of large capacity, and, though in steamers much more room is required for the relatively larger crews as well as for the machinery and fuel, the greater speed of the steamer enables it to carry far more in the course of one year than the sailing vessel could possibly carry. Even bulky goods are being carried in increasing quantities by steamers, not only in consequence of the saving of time and the greater certainty with which the date of arrival can be estimated, but also because steamers can now in many cases carry bulky goods as cheaply, or nearly as cheaply, as sailers. The main reason for this is that bulky goods, if heavy, are often of value as ballast, and partly because steamers are on the average larger than sailers.

Liners and Tramps

Steam vessels fall into two main classes—" liners " and " tramps." Liners are fundamentally mail and passenger boats, but they carry also a certain amount of cargo, and their use in this latter respect is increasing. They follow fixed and regular routes, with predetermined places and times of call. They run to " schedule," their times of departure and arrival are advertised in advance, and the journeys must be made whether or not the ships have, or expect to get, a full cargo or a full passenger list. As a rule, therefore, liners are used only on routes on which there is a regular demand for such traffic in both directions.

Tramps, on the other hand, have no set routes or times, but go wherever they expect to find a cargo. They are simply hired by shippers when required to take a cargo from one port to another, and are thus not tied to any one route but roam about the oceans, the owners frequently directing their movements from home by cable or wireless, as the possibilities of cargo arise. The tramps are definitely cargo boats and have long worked in certain departments of world trade with marked advantage both to themselves and to the traders whom they serve. In recent years, however, they have tended to be replaced on certain routes by the cargo liner. Unlike the liner, which must sail whether a profit or a loss is expected on the voyage, the tramp will not sail without a full cargo : when a tramp is chartered, the charter party usually stipulates for a " full and complete cargo," and, if this is not provided, the charterer has to pay " dead freight " on the deficiency.

The tramp may make a large profit in a very short space of time, and work afterwards at a loss for a long period. It combines cheapness and efficiency with readiness for immediate service, and, unlike the liner, rarely contracts far ahead. The general tendency is for trade demands that are steady throughout the year to be met by the cargo liners, while " seasonal " or unusual or urgent traffic is left to the tramp. Whereas the tramp will go anywhere in search of profit, cargo and passenger liners are employed on what are known as direct service routes—they call at ports *en route* only to land passengers and mails and, on the longer routes, to obtain coal or oil and food.

Great Circle Sailings

As we have already remarked, in the days when ocean transport was solely in the hands of sailers driven along by the wind, the usual direction of trade was largely influenced by the prevailing winds and the main ocean currents, and the distance covered between any two ports was usually many miles longer than the shortest distance which could be taken. Tramp steamers still use these routes as much as possible in order to get what assistance they can from natural forces and thus save fuel, but the modern liner usually takes the shortest course between its ports of call, although this may necessitate a considerably larger expenditure of fuel in order to overcome the resistance of head winds.

Owing to the spherical shape of the earth, the shortest distance between any two points on the earth's surface is (as was explained in Chapter 2) along the arc of the Great Circle which passes through them and which lies on a plane passing through the centre of the earth. Lines of longitude, or meridians, are all great circles, but lines of latitude, with the exception of the Equator, are not. It follows that on a map drawn on Mercator's projection the only straight lines that represent the shortest distance between two points are the Equator and the meridians. Between any other points in the same latitude on such a map, the shortest course will be represented as a curve towards the polar regions—greater or less according to the direction and latitude. So, contrary to what one would be led to expect from a study of many maps of the world, the parallels of latitude are not followed by ships.

Among frequented ocean routes, those of the North Pacific show the most marked deviation from the parallels of latitude, for it is here, where very wide stretches of ocean have to be crossed between the ports of North America and Eastern Asia, that there is the greatest opportunity for taking advantage of great circle routes. Though Yokohama, for instance, is in a more southerly latitude than San Francisco, a steamer proceeding to Yokohama from San Francisco begins by steaming northwestwards, and describes a curve which rises to about 48°N. Likewise, the route from Vancouver to Yokohama passes just south of the Aleutian Islands.

Great circle routes cannot always be followed for various reasons, *e.g.*, in the North Atlantic the danger of icebergs in the northern summer compels ships to keep to the *south* of the great circle route. The same difficulty is experienced on the route between Cape Town and Australia ; in this case, ships have to choose a more *northerly* course than the true great circle route. Moreover, vessels travelling under steam from Australia to South Africa travel northwards, and take an even longer course than that of a circle of latitude, in order to avoid the prevailing "westerlies," which, when they blow directly against a ship, tend to reduce its speed. Hence, by taking a rather more circuitous northerly route, the ships compensate for the extra mileage by a saving in fuel.

There are other factors which operate to prevent ships from following the "short-cut" great circle routes. Vessels going through the Panama Canal to the North Asiatic ports, for instance, cannot follow great circles, for the circles cross a large part of the North American continent. Again, coaling stations are not always situated on great circle routes, and ships often find it advisable to diverge from their shortest course and call at coaling stations off the route so as to avoid having to carry large quantities of bunker coal for the whole or best part of the journey.

Generally speaking, ships aim at keeping as closely as possible to the recognised steamship " lanes " or paths across the oceans, of which a typical example is the well-frequented " lane " between Britain and North America. The advantages of keeping to definite routes are obvious, not the least being that a vessel in difficulties is thereby enabled to get assistance quickly from one or some of the many other ships using the same route. Other advantages readily occur to the mind—a very accurate knowledge of the routes is obtained ; all " danger spots " are well known and accurately marked ; while the ships have the advantage of a wide service of " up-to-the-minute " information on such matters as winds, tides and likely weather changes.

Fuel

The problem of fuel is an important one in ocean transport. Until recently, coal was almost universally used, but oil fuel has displaced it to a certain extent and motor ships are still increasing in number. (*See* page 310).

The great advantage of coal over oil fuel is its cheapness, but it has the disadvantages of requiring much bunker space in the best place in the ship, while it makes necessary comparatively frequent calls at coaling stations en route. Oil fuel can be used either in ordinary boilers to raise steam or without boilers in internal combustion engines. With the latter type of engine, one ton of oil will do the work of four tons of coal, so that there is a very great saving of fuel. Oil fuel requires less bunker space, less handling, storing and stowing, while fewer men are required in the stoke-hold, so that there is a further economy in food, wages and general maintenance of the crew.

As against these advantages, there must be offset the facts that the supply of oil fuel is more limited than that of coal, and that its production is in the hands of large combines. The United States commands over 60 per cent. of the present world output of oil fuel, and the distribution of the other oil reserves of the world is much more restricted than that of coal, which is found in the majority of countries. The distribution of oil to the fuelling points thus involves more difficult problems than does the distribution of coal. For oil transport specially constructed " oil-tankers " are used, and these have the disadvantage that they cannot take a return cargo. This increases the cost of the fuel by increasing the cost of transport, for the fuel has to bear the additional cost of the tanker's return voyage in ballast. Coaling ships, on the other hand, can generally find a return cargo to carry, even if it is only between intermediate ports on the journey. To the great coal-exporting trade of Britain this factor has been of immense value, for the outgoing coal cargoes are carried in ships which come back laden with imports, and so freights generally have been cheapened. The introduction of steamers burning oil must therefore adversely affect this important branch of our trade and must decrease the volume of our transit trade. It is one of the factors, too, which are tending to lessen the favourable balance of trade on which our past commercial leadership has so largely depended.

Ports

The goods taken to a country by ocean vessels for distribution to their final destination, and the goods carried by inland transport services from the areas of production for the purpose of export overseas, must be deposited at a centre where the two modes of transport meet. These centres are the " ports ", which have to be equipped with docks, quays and mechanical devices for loading and discharge.

It must not be thought that important ports are always situated on good natural harbours. The main factors influencing the growth of a port are accessibility to the sea and the nature of the " hinterland," *i.e.*, the area which lies immediately behind the port and for which the port serves as an outlet (*see* Fig. 151). A fine natural harbour may offer unlimited attraction for shipping, but it will not for that reason give rise to the development of an important port, especially if it is situated on the coastline of an unproductive area. Even if the hinterland is productive, the harbour will not necessarily rise to great prominence as a port if access to the hinterland is difficult, for then trade tends to go to another port on the coastline which has easier communications inland, although the harbour, as such, may be inferior.

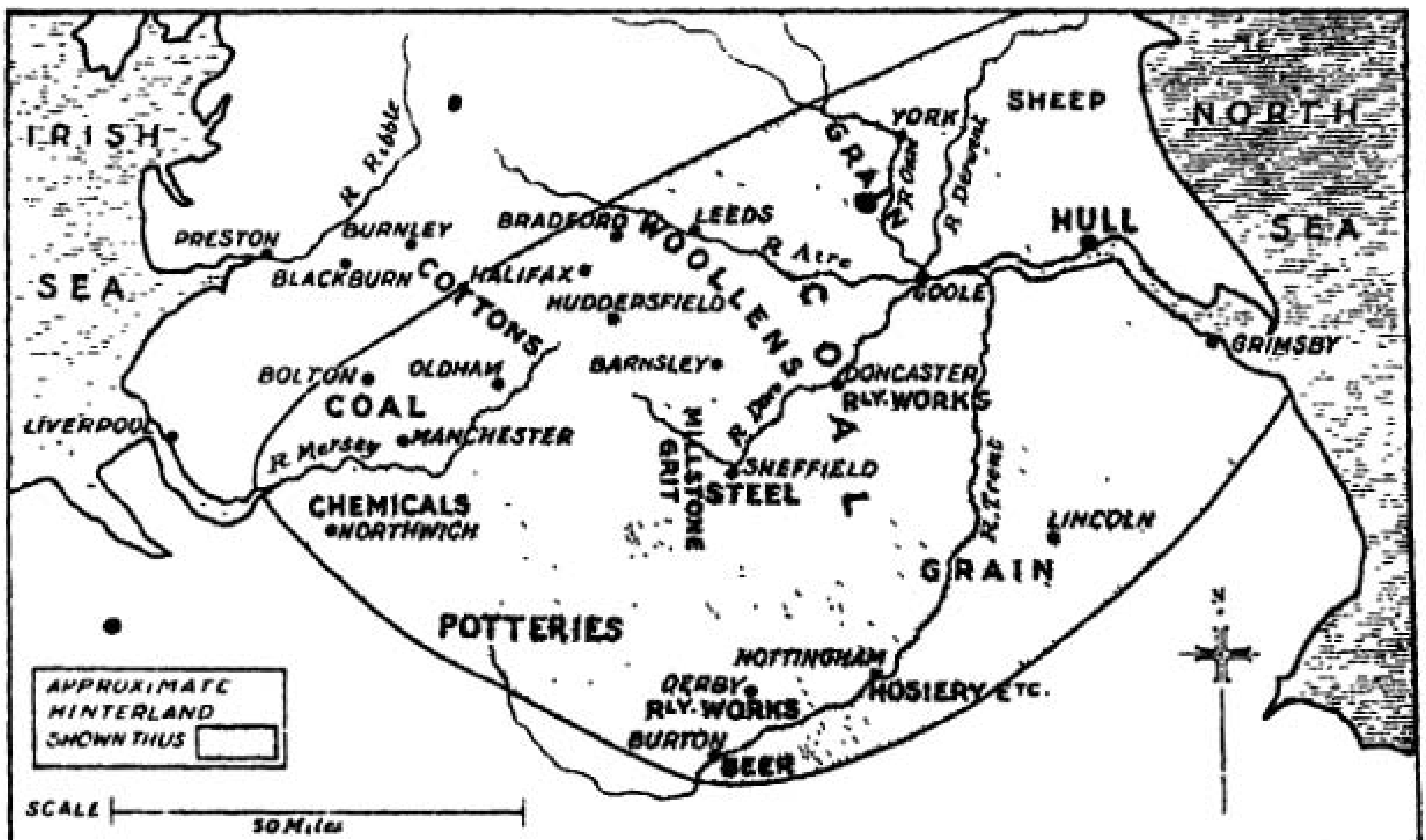


FIG. 151: THE HINTERLAND OF HULL.

It is largely for these reasons that many of the most important ports of the world are situated on or near the mouths of navigable rivers.

Such a situation has the double advantage of enabling ships to work up the river and thus save money in the form of freight, and of being the terminus of an easy inland route, for apart from the traffic of the river itself, its valley provides a natural course for roads and railways. Two obvious examples are London on the Thames estuary and New York on the Hudson. Even when the river is not itself an important means of transport, a port may arise at or near its mouth because of the productive nature of its hinterland and the ease with which it can be reached by land transport, *e.g.*, Karachi, situated near the mouth of the Indus. The hinterlands of ports situated relatively near to one another may overlap. Thus, it is obvious from Fig. 151 that the hinterland of Hull overlaps that of Liverpool, but the ports do not export to the same countries. Hull is mainly the eastern outlet to Europe, whilst Liverpool exports to the west and south.

Other ports owe much of their present importance to the advent of steam navigation, which made necessary places at intervals along ocean routes where steamers could replenish bunkers, and at such places depôts were established with supplies of coal. Ports such as Gibraltar and Aden, for example, have risen to far greater prominence than was justified by their original strategical value, not because of the produce which could be obtained from their hinterlands, but because they were extremely convenient centres at which steamers could call for coal. Now they have entered so largely into the scheme of shipping traffic that they are utilised as oil-bunkering stations in preference to ports situated nearer the sources of supply.

A point that should not be overlooked in connection with the world's great ports is that of depth of water. No port can continue to retain world importance if it cannot accommodate large ships, and as the size of ships has of late been continually on the increase, those ports which have not been able to meet the demand for greater depth have lost trade. This result may be delayed, for the construction of larger ships is dependent not only on the availability of sufficient remunerative traffic but also on the availability of ports capable of accommodating them. In the long run, however, it is inevitable. There are numerous ports, scattered throughout the world, which have harbours inaccessible to large vessels owing to obstructions of various kinds. In such cases the vessels have to unload by means of " lighters " and this fact in itself is sufficient to prevent the rise of such ports to any position of world importance. Depth is important, too, in the case of canals. The Suez Canal, for example, has been deepened several times in order to keep pace with the growth in size of modern vessels.

Entrepôt Trade.

Another important factor influencing the growth of large ports is that class of traffic known as *entrepôt* trade. It is frequently more convenient and more economical to send goods, consigned to several places, to one central distributing depôt, from which they can be despatched to their destinations. Suppose, for example, that goods are being sent from place *A* to a number of countries with which *A* does a comparatively small trade, and between which and place *A* communications are little developed. As likely as not, the consignments will all be sent to *B*, a port centrally situated and with a regular transport service to each of the places of consignment, and at *B* the consignments from *A* will be split up and despatched to their respective destinations. *B* thus develops as an entrepôt, *i.e.*, a port to which goods are despatched for re-export to their ultimate destination.

" The commodities that lend themselves to this method of distribution must have special qualifications. The goods must have high value, small bulk and good keeping quality. By having high value the freight rate is relatively insignificant and the long and devious journeys are not a serious handicap. Having small bulk there is not the demand for a whole shipload of them in any one place, and so it is really cheaper to let them wend their way by transhipments through the common distributing centre or entrepôt. A second factor of influence is the question of distance. The more remote the origin and destinations of the traffic the stronger is the hold upon this trade of the entrepôt with its organisation of routes, ready to serve and hard to duplicate. The trade that best answers to this description and is therefore best fitted to be handled through an entrepôt is that from the Orient to the western world. For many centuries it has comprised articles of small bulk and high value—spices, drugs, silks, curios and tea. These were articles consumed everywhere among the western peoples, but always in small quantities. They were produced in a remote part of the world, and it was commercial economy that they should be distributed among western countries from some western entrepôt. The city best fitted to render this distributing service was the one where varied industry had given the most widespread connections."[1]

Among all great world entrepôts, London stands supreme, though its importance in this connection is diminishing, and its entrepôt trade is becoming more localised. Colombo is another important entrepôt though not, of course, to anything like the same extent as London. Colombo has a fine natural harbour and its central position has made it a converging point for routes from South Africa, East Africa, Aden, India, Malaya, the Netherlands East Indies and Western Australia (see Fig. 140 in Chapter 16). Singapore is the entrepôt for the Malay Archipelago ; Hong Kong for the products of Eastern countries for export to European and other markets ; Hamburg for Scandinavia and the Baltic ; Havana for Cuba ; Alexandria for Egypt ; Karachi for North-west India ; Calcutta for the Ganges valley and Shanghai for the valley of the Yangtse. All these ports, and many others, act as collecting and distributing centres, and nearly all are important re-fuelling depôts also.

---

[1] *Industrial and Commercial Geography*, by J. Russell Smith.

World Shipping Tonnage

World shipping has been seriously affected by the trade depression. From 1914 to 1930, tonnage increased from 49 millions to nearly 70 millions, but Great Britain's share of this increase was small and in 1934 our shipping tonnage was much lower than in 1914, *viz.*, about 17½ millions. The total world tonnage in 1934 was about 65·5 millions and much of this is lying idle for the lack of cargoes. Between 1914 and 1930, the United States increased their tonnage from 5 millions to over 14 millions and that country is now the second of the world's great ship-owning countries. Japan in the same time increased her tonnage by 2½ million tons.

The Table below, compiled from *Lloyd's Register of Shipping*, 1933–34, shows the present position of shipping tonnage of the leading countries. The total tonnage of the British Empire is 20,608,000. It should be noted that " gross " tonnage refers to the total internal volume of a ship, the unit of measurement being a ton of 100 cubic feet. The number of tons (of 2,240 lbs.) of cargo, etc., which a vessel is capable of carrying is called the " deadweight " tonnage.

The export of British coal has fallen considerably, with the result that there has been a scarcity of outward shipping cargoes and an increase of outward voyages in ballast. In addition, freights have fallen much below pre-war level and the combined influences have caused considerable loss to the shipping industry. The main causes of the decline in coal exports are the world slump and the continued increase in the tonnage of motor and oil-burning vessels. In the long run, the latter may be the more serious as it will probably be permanent. At the end of June, 1934, vessels using oil as fuel accounted for 46·4 per cent. of the total world shipping tonnage.

Shipping Tonnage of the Leading Countries in 1934

(excluding sailing ships)

COUNTRY	TONNAGE (Mill.)	% OWNED		% INCREASE OR DECREASE ON 1914
		1914	1934	
Great Britain and Ireland...	17·6	41·6	27·4	[illegible]·7
U.S.A.	9·8	4·5	15·2	+382·2
Japan	4·1	3·8	6·3	+138·5
Norway	4·0	4·3	6·2	+103·4
Germany	3·7	11·3	5·7	−28·3
France	3·3	4·2	5·1	+69·6
Italy	2·9	3·1	4·5	+101·0
Holland	2·6	3·2	4·1	+77·5

World Trade

The volume of trade conducted by any country depends essentially on that country's natural resources and on the commercial enterprise and industrial skill of its people. But apart from this, a country that is pre-eminently a manufacturing country will have a greater volume of trade than a purely agricultural country, if only because the very fact of industrialisation implies a larger population per square mile. Similarly, the smaller countries have usually a larger volume of trade per head of population than the larger countries, whether or not the population per square mile is relatively dense or relatively sparse. Thus, Belgium, a small country, highly industrialised, with a population of 8 millions or nearly 700 per square mile, has a foreign trade of about £40 per head, whilst China, which has a population of about 450 millions distributed in the proportion of about 300 to the square mile, has a per capita foreign trade of only 15*s*. Great Britain, whose population is less than 50 millions but is nearly 500 per square mile, has a foreign trade of about £38 per head, whereas the per capita foreign trade of the United States, with a population of nearly 123 millions or of only 41 persons a square mile, is about £17. Again, Uruguay, a small country whose population is only 28 per square mile, has a per capita foreign trade of about £20, or £3 per head higher than that of the United States.

The difference between the volume of the trade of China and that of the United States is, of course, accounted for by the difference in the stage of industrial development of the two countries. This factor is responsible also for the difference between the per capita foreign trade of Belgium and of Uruguay. But certain other factors require notice.

Such countries as the United States and China, stretching through several degrees of latitude, have a variety of climates and a corresponding variety of products, which enable them to satisfy the needs of their own population from internal sources to a much greater extent than small countries such as Britain and Uruguay. The occupations of the peoples of Uruguay are almost entirely confined to the rearing of cattle and the preparation of products therefrom, and thus many of the necessaries of life have to be imported.

Frequently, the same commodity appears in both the import and the export trade of a country. For this the causes are invariably economic. Thus, British Malaya imports large quantities of raw rubber although she is the world's chief exporter of this commodity. The explanation lies in the fact that Malaya—the world's leading rubber producer—has special facilities and equipment for dealing with the raw commodity, so that quantities of rubber are sent to that country for treatment prior to export to the final destination. Coal is an item in both the import and the export trade between the United States and Canada. It is exported from British Columbia to the west of the United States because it is more economical to do so than to pay the heavier transport charges incurred in bringing it from the more distant coalfields of the United States, and it is exported to eastern Canada from the east of the United States because transport from the United States by the Great Lakes system is cheaper than transport by rail from the Canadian coalfields.

Up to the present, world trade has had what may be termed an "*east-west*" trend, that is, it has been largely concerned with the exchange of products between the Americas and Europe, and between the countries of Asia and the countries of the western world. Gradually the exploitation of tropical lands is tending to change the direction of trade, and to increase the flow of commodities between tropical and temperate lands. In other words, the trade of the future will assume largely a "*north-south*" trend—an exchange of tropical products for the products of the temperate zones.

A further point is that differences in natural resources are not now of such importance in "old" countries as formerly. There are many countries to-day which import certain commodities, not because they are incapable of producing those commodities, but because they find it more advantageous to import them and to produce or manufacture other commodities for export. This exchange arises from the application of the "Doctrine of Comparative Costs," which is ultimately the root of all international trade. Briefly, this economic doctrine is that, even where one country is possessed of greater geographical and other advantages than another for producing two commodities, there is a tendency for the country to specialise in the commodity which it can produce more profitably. The other country will therefore produce the second commodity, and trade will be carried on between the two countries.

Choice of Route and Carrier

Two important points in connection with the transport of goods by sea are the choice of the route to be taken and the type of vessel to be utilised. The deciding factors will usually be the quantity of goods and the type of goods. The "breaking of bulk," or the transfer of goods from ship to rail or to another ship, involves expense and is therefore avoided as far as possible. Cheap transport demands that goods be taken by ship as close as possible to the actual place where they will be consumed, and the route to be chosen should therefore be one on which transhipment is reduced to a minimum.

In connection with the type of vessel, the largest ship that can be filled should be used, for the freight per unit will then be the minimum rate. It is usual, however, to send heavy goods that require a great deal of handling by the most direct route as complete cargoes in small vessels, for the cost of handling these small but heavy cargoes would be increased if they formed part of the cargo of a large vessel. For example, a great deal of coal is sent from British ports in small vessels and much timber comes to Britain in similar vessels, because it is cheaper to fill the small vessel and send direct. Tea, spices and similar light goods, on the other hand, are forwarded as part cargoes or consignments in large vessels, because it is cheaper to fill a large ship with a miscellaneous but easily handled cargo and to distribute the various items on arrival at the port of discharge, than it is to send each of the commodities in smaller vessels direct to their destination. It has already been noted that steamers are being increasingly used for the transport of goods which formerly were the monopoly of the sailer, mainly because a steamer, which must have ballast, can carry bulky goods at very low rates, particularly if it is a large steamer.

It is frequently more economical to send goods by a coastal sailer or steamer from one port in a country to another port in the same country than to make use of the internal transport system. Coastal services are important, for example, along the western shores of South America and Australia: sailers are still largely used on the eastern coast of the United States; and large quantities of coal and other commodities are transported by sea from northern England to London. Such services provide a very cheap means of transport compared with the available inland transport services although they are, in general, neither as speedy nor as regular and reliable.

THE PRINCIPAL OCEAN TRADE ROUTES[1]

In Fig. 152 is roughly shown the direction of the most important trade routes of the world, including those concerned mainly with the transport of goods as well as those concerned with the great movement of passengers, as, for example, the route across the North Atlantic. The ports indicated in Fig. 152 can be identified from the text or from an atlas; and the relative importance of the routes is indicated by variations in the thickness of the lines.

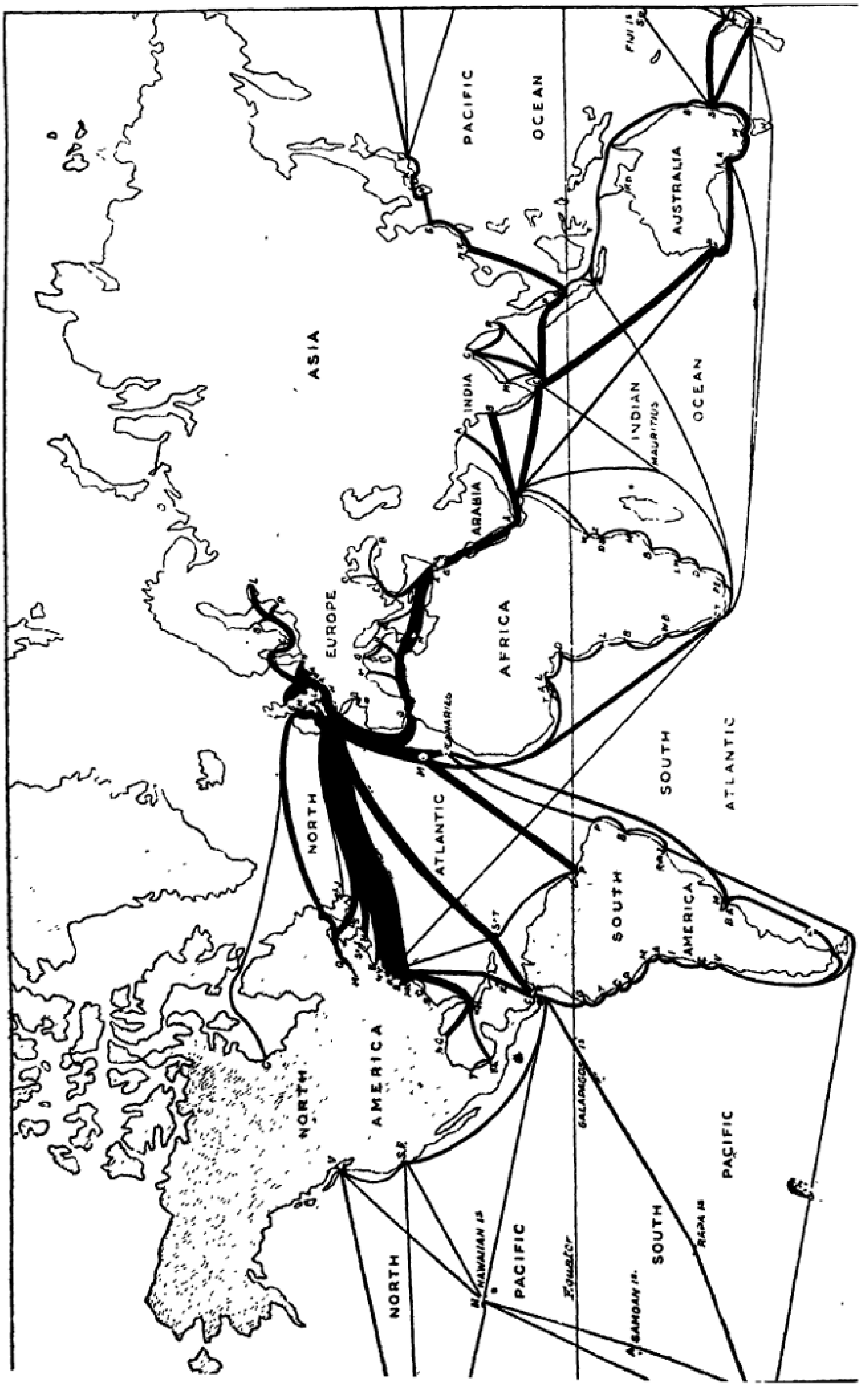
Atlantic Routes

The Atlantic Ocean is the world's most important highway of commerce. The highly industrialised nature of the countries of Western Europe, and the great variety of products, both raw and manufactured, available for export from North America, have inevitably led to the growth of a large stream of goods traffic across the North Atlantic. The passenger traffic also is large and profitable.

The Atlantic routes may be considered as falling into three main divisions, *viz.*, those of (*a*) the North Atlantic, (*b*) the South Atlantic and (*c*) the Mediterranean Atlantic.

---

[1] Based largely on Professor Sargent's *Seaways of the Empire.*


ASIA
EUROPE
AFRICA
ARABIA
INDIA
AUSTRALIA
NORTH AMERICA
SOUTH AMERICA
PACIFIC OCEAN
NORTH ATLANTIC
SOUTH ATLANTIC
INDIAN OCEAN
MAURITIUS
CANARIES
FIJI IS
GALAPAGOS IS
HAWAIIAN IS
SAMOAN IS
RAPA IS
NORTH PACIFIC
SOUTH PACIFIC
Equator

North Atlantic Routes. The route from Europe to North America is the most important of the world's shipping routes, and the greater part of the world's present coal and oil supplies are situated near it. Large quantities of foodstuffs (such as wheat and meat), raw materials (such as oil and cotton) and manufactured goods are sent from the United States to Europe, in return for which mainly manufactured goods are shipped in the opposite direction. As the volume of traffic is greater from the United States to Europe than that from Europe westwards, many ships return to the States in ballast. From Canada and Newfoundland the movement is more evenly balanced, but even here the greater volume of goods moves eastwards and many ships have to return from Europe in ballast.. The cargoes from Canada and Newfoundland include wheat, pulp and timber, whilst the outward cargoes from Europe consist of manufactured goods (largely iron and steel products), coal, salt, cement and clay.

New York lies almost on a great circle from Colon (Panama) to the west of Ireland, and the shortest route from Liverpool to the Gulf of Mexico would pass to the west of Newfoundland and Nova Scotia and near New York through the New England States. As a consequence, New York and New Orleans are developing as transhipment ports. Steamers which ply between the Gulf of Mexico and New York unload their cargoes at the latter port, whence the goods are taken on board by ships which serve the Atlantic routes from New York to Liverpool and other European ports.

The most important ports of the North Atlantic routes are (*a*) in Europe: Hamburg (Germany); Amsterdam and Rotterdam (Netherlands); Antwerp (Belgium); Cherbourg and Le Havre (France); London, Southampton, Liverpool and Glasgow; and (*b*) in North America: St. John's (Newfoundland); Halifax, Sydney, St. John, Quebec and Montreal (Canada); Boston, New York, Philadelphia, Baltimore, Newport News, Charleston, Galveston and New Orleans (United States). The movement of passengers between all these ports on the North Atlantic route is very great, and danger from floating ice causes the routes to move further south during the summer months (when the ice breaks away as icebergs and ice floes) than the more northerly great circle route followed in the winter.

Vessels to the Baltic usually proceed *via* the Skagerrak if calling at Denmark, Norway and the west coast of Sweden, whereas they use the Kiel Canal for the Baltic ports of Germany, Russia, Finland, the Baltic Repub[illegible]s and the east coast of Sweden. The outward cargoes from the Baltic consist largely of wood and wood products, iron ore and dairy produce; whilst the inward cargoes are usually of coal, machinery, textiles and other manufactured goods.

The main trade routes to the West Indies and Central America are those from Europe and the east coast of North America. Coal, textiles and other manufactures are sent from Europe, and coal, cement, oil, meat, flour, textiles and miscellaneous manufactures from the United States, whilst the return cargoes consist of fruits (particularly bananas), sugar, coffee, hardwoods, asphalt, cigars, oil (to Europe) and ores. For the transhipment of fruit special boats with refrigerator equipment are used. Vera Cruz and Tampico (Mexico), Havana (Cuba), Kingston (Jamaica), and Colon (Panama), are the principal ports of this area. Bristol has a large trade in tobacco, fruit and sugar with the West Indies.

SOUTH ATLANTIC ROUTES. The routes of the South Atlantic are less concentrated than those of the North Atlantic. The main trend of trade takes two directions—that to South America and that to South and West Africa.

The South American Routes are concerned largely with the products of Brazil and of the River Plate region. From Europe to the River Plate the route is *via* Madeira and the Canary Islands to Montevideo and Buenos Aires with cargoes of coal and miscellaneous manufactures, the return cargoes consisting largely of grain, wool, linseed and meat.

The Amazon basin is connected with Europe from Para *via* Madeira, and southern Brazil from Rio de Janeiro, Bahia and Pernambuco *via* the Canaries and Madeira. The outward cargoes from Europe are similar to those for the River Plate, but the return cargoes from Brazil consist of tropical products such as coffee, rubber, nuts, cotton, sugar, hardwoods, meat, hides and skins.

These return cargoes from Brazil to Europe are of much smaller bulk than the outward cargoes, and this, combined with the growth of trade between the United States and South America and with the shortage of cargoes from Europe to North America, has led to the development of a *triangular* route or movement of goods between Europe, South America and North America. Shipments of coal and manufactured goods are made from Europe to South America, whence cargoes of rubber, coffee, hardwoods and other tropical produce are carried to the east coast ports of North America, and from these the ships load up with food, raw materials and manufactured goods for European ports.

The African Trade Routes are largely concerned with the carrying of tropical and sub-tropical products to Europe in exchange for manufactures. The route to West and South Africa naturally follows the west coast of south-western Europe to Madeira and the Canaries. Off Cape Verde, the Cape route takes a more southerly course than the West African route, and makes directly south-east for the Cape.

Textiles and iron goods are shipped from Europe to West Africa, while quantities of cacao, palm-oil, palm-kernels, tropical fruits, rubber and tin are sent in return from such ports as Takoradi and Accra (Gold Coast), Lagos (Nigeria) and Benguela (Angola).

The direct lines from Europe to South Africa take many passengers in addition to coal, textiles, iron and steel goods, cement and miscellaneous manufactures. South Africa returns gold, diamonds, wool, ostrich feathers, fruit, hides, skins, maize and copper. The great bulk of traffic is therefore borne on the outward journey from Europe, and many vessels, to avoid having to return to Europe in ballast, proceed from the Cape in ballast to India, where they load up with Indian produce and return to Europe *via* the Suez Canal route.

The principal ports on the South African route are Cape Town, Port Elizabeth and Durban. Steamers on the Cape route require adequate bunkering facilities, and as the Canary Islands and Madeira are on a great circle from Europe to the south, they have become important bunkering stations, taking enormous quantities of coal from various British and European ports, and especially from those of South Wales.

MEDITERRANEAN ATLANTIC ROUTES. The exchange of products on this route takes the form of the movement of typical Mediterranean products (wine, fruits, vegetables and esparto grass) and of minerals (iron, lead and copper) to the Atlantic ports of Europe, whilst the outstanding return cargo is coal. Formerly nearly all the Mediterranean products were sent to London for distribution, but of late an important direct trade has arisen between the Mediterranean ports (Marseilles, Istanbul, Genoa and Naples) and New York, and this has greatly weakened London's position as a world entrepôt.

Suez Routes to the East

The trade routes through the Mediterranean Sea and the Suez Canal to Asia and Australia are second in importance to those of the North Atlantic. The great difference between the products of Western and Southern Europe and those of the monsoon lands has done much to stimulate trade between these two regions, whilst the rise of Australia and New Zealand as important wool, wheat, dairying and meat producing regions has been accompanied by a marked growth of trade between these countries and Europe.

The route follows the west coast of south-western Europe to Gibraltar, thence through the Mediterranean Sea to Malta and Port Said, through the Suez Canal to Suez, and through the Red Sea to Aden—an important coaling station. From Aden the Suez routes divide into several branches, the most important of which go to Colombo, Bombay and the west of Australia. Vessels for India, carrying cargoes of coal, textiles and other manufactures, go either direct to Bombay or to Colombo, whilst others proceed to Karachi. Others again proceed first to Bombay, then to Colombo, and finally to Calcutta or Rangoon. A subsidiary route is the one which proceeds south to the East African ports.

Mails and passengers from this country to the East usually cross from Dover to Calais, and thence proceed overland to one of the Mediterranean ports (*e.g.*, Marseilles or Brindisi) where they join the vessels which have come round the Iberian Peninsula. This method not only saves considerable time, but also, so far as passengers are concerned, enables them to avoid the frequently disturbing crossing of the Bay of Biscay.

The return cargoes from India and other eastern countries consist of wheat, precious stones and a variety of tropical and sub-tropical products, including tea, rice, cotton, jute, oil-seeds, teak, spices, drugs, dyes, hides and skins. As India supplies much of the bulky raw materials and foodstuffs required by Western Europe, the cargoes from that country to Europe are usually of greater bulk than the cargoes in the reverse direction. Many ships must therefore voyage outwards to India in ballast unless they can pick up an outward cargo to South Africa. For the same reason, other ships take an indirect route, with the object of picking up cargo wherever possible, whilst others again ship coal from the Southern Hemisphere to India, or may take coal from European ports to the Canaries or Mediterranean and then proceed to India in ballast.

From Colombo a route goes to Penang and Singapore (the latter the principal collecting and distributing centre for the products of the Malay Peninsula, *e.g.*, rubber and tin), and thence to China and Japan, which provide cargoes of silk and silk products, tea, beans and bean-cake, in exchange for textiles, machinery and other manufactures from the Western world.

The route to Australia, after leaving Aden, proceeds either directly across the Indian Ocean or *via* Colombo to Fremantle, Adelaide, Melbourne and Sydney. From Sydney vessels continue to Wellington or Auckland in New Zealand. The outward cargoes to Australia and New Zealand are for the most part manufactured goods such as machinery and textiles, return cargoes being made up of wool, meat, fruit, wheat, butter, cheese and minerals. There is an important coal trade between Australia and New Zealand.

The route to the east coast of Australia proceeds *via* Singapore, the Java Sea and Torres Strait to Brisbane, with a branch to Port Darwin. This route is not so important as the route which reaches the east of Australia *via* the west and south coasts.

Suez Canal

The Suez Canal, joining the Mediterranean Sea to the Red Sea, was opened in 1869. In its construction three lake formations—Balah Lakes, Lake Timsah and the Bitter Lakes—were utilised, and, since its first opening, the Canal has been several times deepened and widened to allow the largest ships to pass through. Its length is 101 miles and the average time of transit 15 hours, ships having to proceed slowly so that the wash set up will not damage the banks, and because at present two ships cannot pass abreast (one having to " lay-up " in one of the bays specially provided for that purpose at intervals of about five miles). The latter defect is now being remedied by the widening of the Canal.

A railway line follows the Canal from Port Said to Suez, with a branch to Cairo. Since 1888, the Canal has been exempted from blockade, and has been open to the vessels of all nations in peace or war. The Canal is owned by a company, of which the largest individual shareholder is the British Government, and the waterway is lighted at night by electricity to allow constant navigation.

The opening of the Suez Canal provided a new ocean route to India, the Far East and Australia. Before the Canal was opened the sea route to India and the Far East went round the Cape. This involved a long journey along the West Coast of Africa which was, at that time, of little commercial importance, and, after the Cape, a similarly unproductive journey across the Indian Ocean. Now, however, the journey from London to Bombay *via* Suez is 4,563 miles shorter and that to Melbourne about 1,000 miles shorter than the Cape route.

The cutting of the Suez Canal had a two-fold effect. In the first place, since the winds in the canal region were too weak for sailing ships, a new type of vessel was evolved, propelled both mechanically by steam and naturally by wind. The second effect was to divert the growing trade to Australasia from the Cape route. This latter effect was due partly to the shorter distance and partly to the absence of coaling stations on the longer route—one of the main advantages of the Suez route being that the presence of so many coaling stations thereon makes possible frequent refuelling and so enables the ships to increase their cargo space at the expense of bunker space.

More recently, however, the rapid development of more efficient engines and the ability of newer ships to cover a greater steaming distance for a given quantity of coal, combined with the desire to avoid canal dues and the loss of time through calls at many ports, has caused steamship lines working the Australasian routes to use the Cape route rather than the Canal route. The Canal remains, however, the main means of communication to India and Eastern Asia as the long sea journey round Africa is thereby avoided.

Pacific Routes

The Pacific routes are of far less importance than those already discussed, mainly because the countries surrounding the Pacific are nothing like as commercially important as those which border the Atlantic, and partly because of the great distances separating the land masses and because there are fewer coaling stations *en route*.

Despite the appearances to the contrary on examination of a map of the Pacific, Shanghai, Yokohama, San Francisco and Panama are almost on a great circle. There are direct services from Vancouver, Victoria and San Francisco to Yokohama and Shanghai. Cargoes from China and Japan to America comprise tea, silk, beans, oilseeds and foodstuffs, whilst the return cargoes include kerosene, grain, lumber, rails and manufactured goods. The trade across the Japan seas is similar in many ways to that across the North Sea and the English Channel, with an export of raw materials from the mainland to Japan (Nagasaki and Kobe) and a return trade in Japanese manufactures to the mainland of Asia.

The routes of the South Pacific only approximate to great circles. Wellington and Auckland (New Zealand) lie practically on a great circle passing near to Rapa Island and the Galapagos Islands to Panama. Vancouver is connected to Suva in Fiji *via* Honolulu in the Hawaiian Islands, and at Fiji the route divides, one branch proceeding to Auckland and another to Sydney. Steamers from San Francisco to New Zealand and Australia call at Honolulu and occasionally at the Samoan Islands, the port of which is Apia, or at Suva. The southern routes are of little commercial importance partly because there is no great density of population in the bordering countries and also because of the danger from floating ice. Hence, the volume of traffic along them is very small compared with that on the North Atlantic and Suez routes. The outward cargoes from America consist largely of coal and manufactured goods, with return cargoes of meat, wool and other raw materials.

There is a large coastal traffic along the west coast of South America, and much coal is carried to Callao, which is an important coaling station. The outward traffic from this area consists chiefly of minerals—nitrates, oil and copper. Many tramp steamers and all sailing vessels from Atlantic ports to the west coast of America proceed *via* the Cape Horn route. The coastal traffic of both North and South America intermingles to a great extent with the Panama Canal lines.

Panama Canal

The Panama Canal, which pierces the narrow Isthmus of Panama, between North and South America, was first opened to commercial traffic in 1914, and has since provided an immensely important ocean route between the east and west coasts of the two Continents. At the Atlantic end of the Canal the lower Chagres valley is converted by a dam into a lake which is entered by locks at Gatun, and the Canal then follows the river to Obispo. From Obispo the Canal had to be taken through the hills to the Pacific plains by means of the famous Culebra Cut, access to which is obtained by locks at Pedro Miguel and Miraflores.

The Canal is 50 miles long, with a varying depth—41 feet at the Atlantic entrance, 45 feet through the Culebra Cut, 85 feet in parts of Gatun Lake—and is naturally at its widest in Gatun Lake and at its narrowest in the Cut. It is the property of the United States Government which also leases a strip of land in Panama, 10 miles wide, through which the Canal runs. To protect the Canal the United States have constructed immense fortifications, which also act as a base from which land, sea and air forces operate.

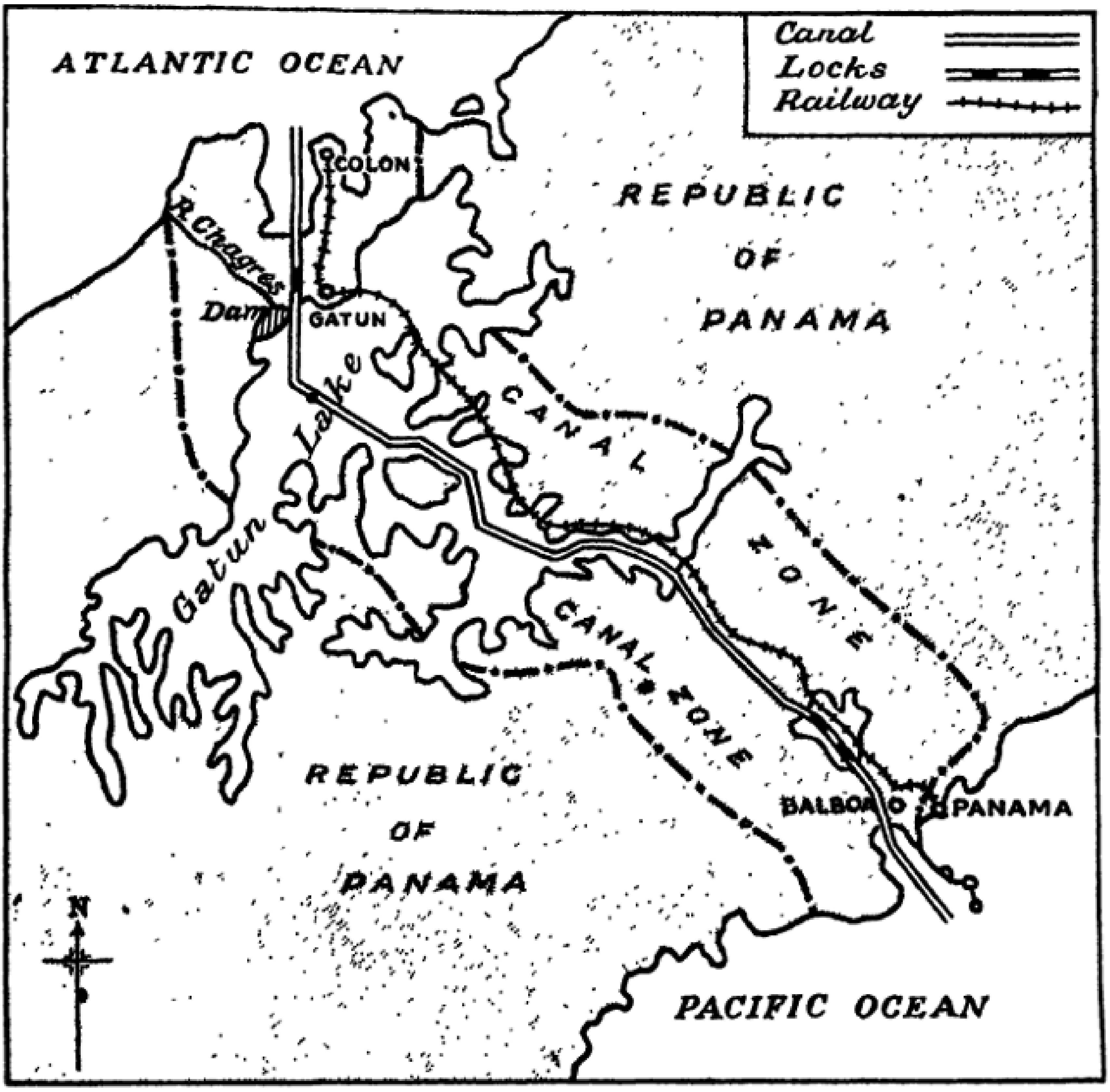


FIG. 153: THE PANAMA CANAL.

The opening of the Panama Canal was of vast importance to the United States and, to a somewhat less extent, to Western Canada and South America. It greatly reduced the sea distance between the ports on the western and eastern coasts of North America, as also between Europe and western America, while Europe and the industrialised areas of the north-east of the United States were brought very much nearer the Pacific coast of South America. Liverpool, for example, is now 5,600 miles nearer San Francisco and 1,500 miles nearer Valparaiso than it used to be *via* Cape Horn. Again, North America is now more favourably placed in relation to Australia than the countries of Europe, for the Canal greatly reduced the distance between the first two continents, whereas it has not lessened the distance between Europe and Australia; and although Europe is slightly nearer New Zealand than it was *via* Cape Horn or the Cape of Good Hope, eastern North America is now much more favourably situated in relation to that Dominion. The Canal brought New York 3,900 miles nearer Sydney, whereas the Canal route between Liverpool and Sydney is 150 miles longer than the eastern route, although it brought Liverpool 1,500 miles nearer Wellington.

Apart from the question of distance, the Panama route is not as suitable as the Suez route for European steamers because it is not so well equipped with coaling stations.

The Chinese and Japanese ports north of Hong-Kong are now much nearer eastern North America but they are not any nearer to Europe; by Canal New York is 5,700 miles nearer Yokohama but the Canal route between Liverpool and Shanghai is 2,700 miles longer than the eastern route, while the Canal route from Liverpool to Yokohama is 694 miles further than by the eastern route.

The trade through the Panama Canal consists largely of goods traffic between the eastern and western coasts of North America and to a less extent between Europe and western America. The Canal has provided the United States with an alternative east-west route which enters into strong competition with her transcontinental railways, and with a means whereby her fleet can operate in either the Atlantic Ocean or the Pacific Ocean. The trade facilities between the eastern ports of the United States and Australasian ports have been vastly improved, whilst Vancouver and San Francisco have greatly benefited in relation to the European trade. The export of wheat from Vancouver to Europe has now reached the large total of 100,000,000 bushels annually, and British Columbian coal finds a ready market at Panama.

The route from Europe to Australia and New Zealand *via* the Panama proceeds south-west to St. Thomas (West Indies), thence to Colon at the Atlantic end of the Panama Canal, through the Canal to Panama and Balboa on the Pacific coast, across the Pacific, passing close to the Galapagos Islands and Rapa Island to Auckland in New Zealand, and finally round the North Island of New Zealand to Sydney or south to Wellington and thence to Sydney. The Yokohama route branches off at Balboa and proceeds north-west *via* Honolulu to Japan. The route to Vancouver branches off at Balboa and follows the western coast of North America, proceeding either direct to Vancouver or calling at San Francisco on the way.

A careful study of the figures given above showing the distances gained by using the Panama Canal leads to the conclusion that a round-the-world route for large cargo liners is a likely development. Cotton, grain and American and Canadian manufactures could be shipped to

Europe as at present. The vessel would then proceed through the Suez Canal to Asia with cargoes of European manufactured goods (*e.g.*, cotton cloths, iron rails and machinery), returning from Asia to the east coast of America with Asiatic produce such as rubber, silk, spices and tea. A route of this character would lessen the return traffic in ballast of vessels from Europe to North America.

The amount of traffic now using the Panama Canal is so great that the United States are considering the possibility of constructing a canal across Nicaragua in order to relieve the congestion. The tonnage passing through the Canal is normally about the same as that using the Suez Canal, *viz.*, 30 million tons approximately, but whereas over 50 per cent. of the vessels passing through the Suez Canal are British, about the same percentage using the Panama Canal are United States' vessels, and of these, the great majority are engaged in trade between the east and west coasts of North America.

QUESTIONS ON CHAPTER 20

1. Describe alternative routes for shipping from England to (*a*) Cape Horn and (*b*) the Cape of Good Hope. (*R.S.A.*, *Stage I*, 1930)
2. Describe a journey by sea from London to Calcutta *via* the Suez Canal, paying particular attention to British possessions en route. (*C.C.S. Prelim.*, *May*, 1931)
3. If you were called on to make the following journeys as quickly as possible, state by what routes, and how, you would go, and estimate roughly the time you would take:—
    - (*a*) San Francisco to Oslo.
    - (*b*) Berlin to Buenos Ayres.
    - (*c*) Manchester to Yokohama.
    - (*d*) Chicago to Sydney. (*S.A.A. Prelim.*, *May*, 1930)
4. Describe the Panama Canal and compare its importance to America with that of the Suez Canal to Britain. (*C.I.I. Associateship, Accident Branch*, 1931)
5. Describe three routes by which a passenger might travel from England to Australia. (*C.I.I. Associateship, Accident Branch*, 1931)
6. Describe a sea voyage from New York to Valparaiso, and cite relevant distances. (*C.I.I. Associateship, Marine Branch*, 1932)
7. A ship's Captain to-day need never be out of touch with his principals for any appreciable length of time. Discuss the means of communication, on sea and land, having regard, particularly, to modern developments. (*C.I.I. Associateship, Marine Branch*, 1932)
8. Give an account of the main steamship routes of the North Atlantic naming the chief passenger ports on each side of the ocean. (*C.I.I. Prelim.*, 1931)
9. Describe the route by which you would travel from London either to Cape Town or to Calcutta. Furnish a sketch-map. (*I.C.W.A. Prelim.*, *Dec.*, 1931)

10. Discuss the past and future effects on commerce and on international relations of the construction of the Panama Canal. (*I.C.W.A. Prelim., June,* 1931)

11. A British Rugby Football team will tour New Zealand next summer.
    (*a*) Explain why football is played in New Zealand in July.
    (*b*) Describe briefly *two* possible steamship routes from London to New Zealand, giving ports of call. (*C.S., March,* 1930)

12. Write a short account of *two* of the following :—
    (*a*) An aeroplane route from London to Sydney in Australia ;
    (*b*) A steamship route from Liverpool to San Francisco ;
    (*c*) A railway route from Paris to Constantinople. (*C.S., March,* 1929)

13. Briefly describe TWO of the following :—
    (*a*) A route by which a man could travel quickly by sea and land from Belfast to Aberdeen ;
    (*b*) A railway journey from Perth to Melbourne ;
    (*c*) A steamship route from New York to San Francisco. (*C.S., May,* 1929)

14. A ship from Shanghai reaches an English port laden with rubber, tea, coconuts, silk, tin, and jute, some of which she has picked up on the voyage. Briefly describe the route that the vessel may have taken, and name the port where each of these products was probably taken on board. (*C.S., August,* 1931)

15. State, with a brief description, the precise position of (*a*) the Suez and (*b*) the Panama Canal, and indicate the importance of each as a highway of trade. (*C.S., Oct.,* 1928)

16. Describe the great shipping routes of the North Atlantic, and note any ways in which the routes followed are still influenced by prevailing winds or other climatic factors. (*L.M., June,* 1929)

17. What do you understand by the hinterland of a port ? Illustrate fully from the following : Marseilles, Hamburg, Liverpool. (*I. of B., Pt. I,* 1931)

18. Discuss the conditions favourable to the growth of a great port, with two examples from Europe. (*C.I.I. Associateship, Accident Branch,* 1932)

19. What group of ports have been most affected by the existence of the Panama Canal ? What, on geographical grounds, should you think were the chief bulk cargoes passing through the Canal ? Give reasons. (*I. of B., Pt. I.,* 1934)

PART II

REGIONAL GEOGRAPHY

CHAPTER 21

EUROPE

THE continent of Europe is the centre of the habitable world, and may be regarded as a series of peninsulas extending westward from the main land-mass of Asia and Europe (commonly known as " Eurasia "). It is bounded on the north by the Arctic Ocean, on the west by the Atlantic Ocean, and on the south almost completely by the Mediterranean Sea, the Sea of Marmara and the Black Sea. Europe is separated from Africa, to which it was once joined, by the narrow Mediterranean Sea. The generally accepted geographical boundary between Europe and Asia is the line formed by the Ural Mountains, the Ural river, the Caspian Sea, and the Caucasus Mountains in the south-east ; but this boundary is not definite and the continent is really a vast peninsula of Asia.

Europe lies almost wholly in the north temperate zone. In the north a small part is within the Arctic Circle, but in the south no part is within the Tropics. Its total area is about 3,800,000 square miles, and its total length from Cape Nordkyn (Norway) in the north to Cape Matapan (Greece) in the south about 2,400 miles. The coastline is long in comparison with the size of the continent and, in some places, particularly where the mountains come down to the sea, is very irregular.

Political Divisions

Though Europe is the smallest of the continents, it contains within its boundaries more independent political units than any of them. This division of political control is a great drawback, for it not only leads to political unrest, but also, from a commercial point of view, gives rise to tariff walls and other political hindrances which retard economic development. A " United States of Europe," politically similar to the United States of America, or even united for the purposes of trade only, would be of great commercial benefit to the continent as a whole and to the countries individually.

Political Divisions of Europe

COUNTRY	POLITICAL STATUS	CAPITAL
1. Norway	Kingdom	Oslo
2. Sweden	Kingdom	Stockholm
3. Finland	Republic	Helsingfors
4. Estonia	Republic	Tallinn
5. Latvia	Republic	Riga
6. Lithuania	Republic	Kovno
7. European Russia	Part of Russian Republic	Moscow
8. Poland	Republic	Warsaw
9. Rumania	Kingdom	Bucharest
10. Hungary	Republic	Budapest
11. Czechoslovakia	Republic	Prague
12. Austria	Republic	Vienna
13. Switzerland	Republic	Berne
14. Germany	Republic	Berlin
15. United Kingdom	Kingdom	London
16. Irish Free State	British Dominion	Dublin
17. Denmark	Kingdom	Copenhagen
18. The Netherlands (Holland)	Kingdom	The Hague
19. Belgium	Kingdom	Brussels
20. Luxemburg	Independent Duchy	Luxemburg
21. France	Republic	Paris
22. Spain	Republic	Madrid
23. Portugal	Republic	Lisbon
24. Italy	Kingdom	Rome
25. Yugoslavia	Kingdom	Belgrade
26. Bulgaria	Kingdom	Sofia
27. Greece	Republic	Athens
28. Albania	Kingdom	Tirana
29. Turkey-in-Europe	Part of Turkish Republic	Angora (in Asia)

Norway and Sweden are referred to geographically as the " Scandinavian Peninsula " ; Finland, Estonia, Latvia and Lithuania as the " Baltic Republics " ; Rumania, Hungary, Czechoslovakia and Austria as the " Danube Lands " ; the United Kingdom and the Irish Free State as the " British Isles " ; the Netherlands and Belgium as the " Low Countries " ; Spain and Portugal as the " Iberian Peninsula " ; and Yugoslavia, Bulgaria, Greece, Albania and Turkey-in-Europe as the " Balkan Peninsula." Northern Germany, Poland and Central Russia are the main constituents of the Great Lowland Plain, or the Great Central Plain of Europe.

European Seas

The *White Sea*, to the north of European Russia, is a branch of the Arctic Ocean. The *North Sea*, between eastern Britain and the Continental mainland, has an arm (known as the *Skagerrak* between Norway and Denmark and as the *Kattegat* between Sweden and Denmark) leading into the *Baltic Sea*. The Baltic opens into the *Gulf of Bothnia* to the north between Sweden and Finland, into the *Gulf of Finland* to the east and into the *Gulf of Riga* to the south-east. Between southern Britain and the mainland are the *Straits of Dover* and the *English Channel*, and off the west coast of France is the *Bay of Biscay*. To the south of Europe is the great *Mediterranean Sea*, connected with the Atlantic only by the narrow Straits of Gibraltar. The *Tyrrhenian Sea* lies between Italy and Sardinia, the *Adriatic Sea* between Italy and Yugoslavia, and the *Aegean Sea* between Greece and Turkey-in-Asia. The Aegean is connected by the narrow *Dardanelles* with the small *Sea of Marmara*, which in its turn is connected by the *Bosporus* with the *Black Sea*. From the Black Sea the *Straits of Kerch* lead into the smaller *Sea of Azov*. The *Caspian Sea* is an entirely isolated inland sea in south-east Europe, and forms part of the boundary between European Russia and Asiatic Russia.

European Islands

There are numerous islands off the European coasts. The most important are the *British Isles*, lying on the continental shelf to the west. These consist of the two larger islands of *Great Britain* (England, Wales and Scotland) and *Ireland* (Northern Ireland and the Irish Free State), as well as a large number of smaller islands, including the *Orkney Islands* and the *Shetland Isles* in the North ; the *Isle of Man* and the *Isle of Anglesey* in the Irish Sea ; the *Isle of Wight* and the *Channel Islands* in the south ; and the *Scilly Isles* in the extreme south-west. Ireland is separated from Scotland by the *North Channel*, from northern England by the *Irish Sea* and from Wales by *St. George's Channel*.

Iceland, the next in point of size, lies to the extreme north-west of the continent, about 700 miles from the mainland, and with its northern coast fringing the Arctic Circle. Between Iceland and the Shetland Isles are the Danish *Faroe Islands*. Small islands are dotted along the whole length of the coast of Norway, the principal group being the *Lofoten Islands* in the north, while between the south of Sweden and the mainland of Denmark lie a number of islands, the largest and most important being the island of *Zealand*, on which stands Copenhagen, the capital of Denmark. The Spanish *Balearic Islands* (the largest being *Majorca*) lie off the east coast of Spain in the Mediterranean and the *Azores* (Portuguese) are situated out in the Atlantic over 1,000 miles from the mainland.

South of the Gulf of Genoa lie *Corsica* (French) and *Sardinia* (Italian), whilst at the " foot " of Italy and forming part of Peninsular Italy is the island of *Sicily*. South of Sicily is the group of three British islands which includes *Malta*. Off the west coast of Greece are the Greek islands of *Corfu* and the *Ionian Islands*, whilst to the south of Greece is the Greek island of *Crete*. There are also numerous small islands in the Aegean, the Adriatic and the Baltic.

Relief of Europe

The surface of Europe (see Fig. 154) may be divided into (1) The North-Western Highlands ; (2) The Central Plain, and (3) the Southern Highlands.

The North-Western Highlands are the remaining portions of an ancient mountain mass, largely metamorphic, so worn that they now take the form of a worn-down plateau. One branch of these highlands consists of the *Highlands of Scotland* and the high *Plateau of Scandinavia.* Another can be traced through Cornwall and Brittany

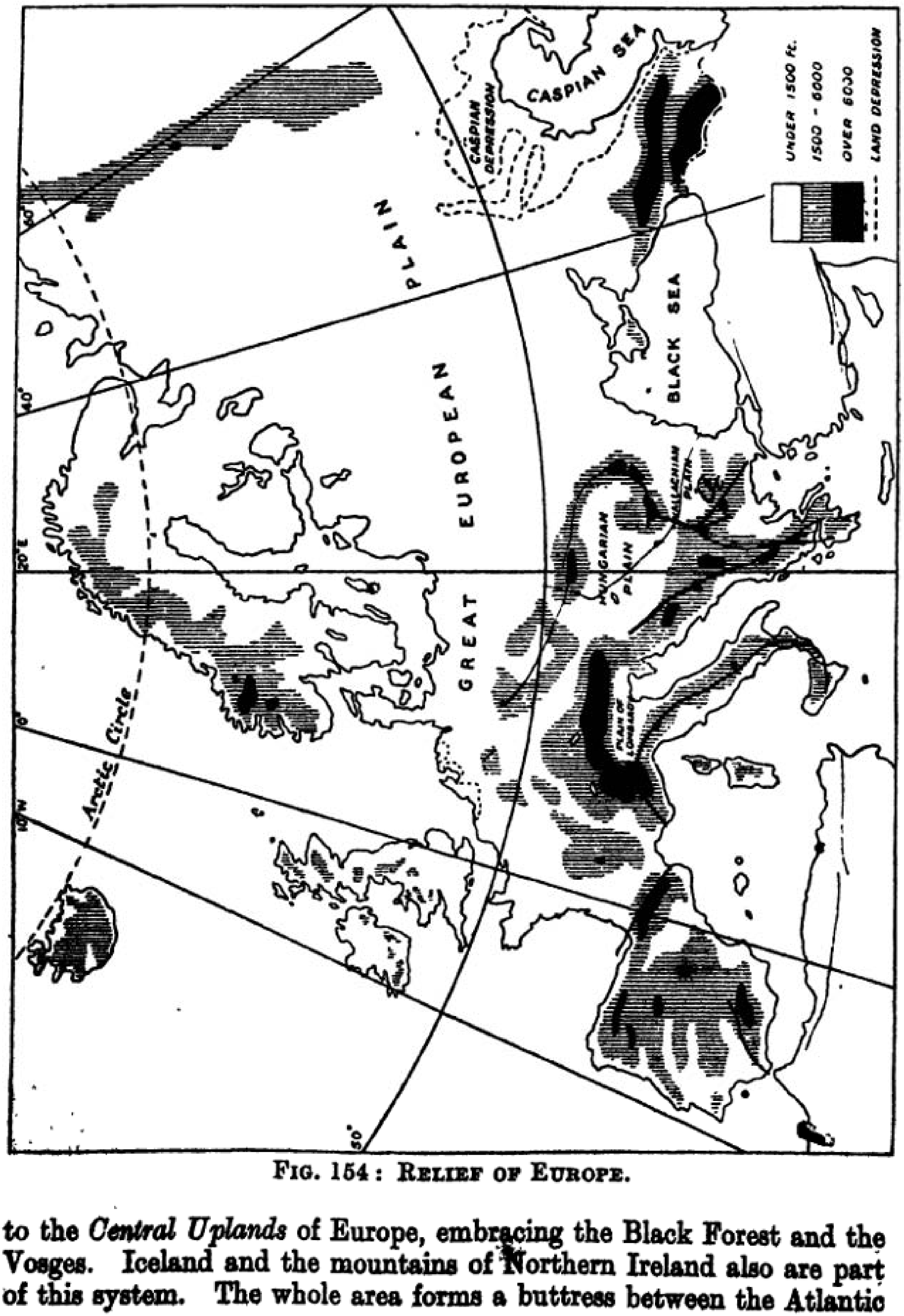


Fig. 154: Relief of Europe.

to the *Central Uplands* of Europe, embracing the Black Forest and the Vosges. Iceland and the mountains of Northern Ireland also are part of this system. The whole area forms a buttress between the Atlantic

Ocean and the continent, and through this buttress the sea has broken in places to form seas, such as the North Sea.

THE CENTRAL PLAIN, or "Great European Plain," covers the greater part of the continent. It consists largely of horizontal layers of sedimentary rocks overlying old metamorphic rocks and is covered with material brought down from the original highlands. The plain stretches, with minor elevations, from Ireland in the west to Asia in the east, and from north Russia, Germany and the Low Countries in the north, to northern France and south European Russia in the south.

The countries included in this area are Ireland, south-eastern England, northern France, Belgium, Holland, northern Germany, Denmark, Poland, Lithuania, Estonia, Latvia and European Russia. The plain is not absolutely level, but is undulating in character. Some parts, such as the Baltic Sea, have been drowned, whilst others, such as parts of the Netherlands, are below sea-level; others, again, such as the Caspian Sea, are still being built up, while some other parts are hilly. The main upland region is the *Valdai Hills* to the west of Moscow, but even these rise only to some 600–1,000 ft. above sea-level, although they are the source of important rivers, such as the Volga and Dnieper.

THE SOUTHERN HIGHLANDS stretch from the Carpathians, in the east, to Spain in the west and from south of the Great Plain to the southern peninsulas. They are complex young fold mountains with the Alps as the core or central point.

The *Alps* lie generally in a north-east to south-west direction. From the north-east they run east, and after a break (through which flows the River Danube), continue east and south-east as the *Carpathian Mountains* and then turn west as the *Transylvanian Alps*. Another break then occurs (again used by the Danube) and the mountains reappear in a southerly direction and divide, one branch turning east as the *Balkan Mountains* and the other continuing south-east as the *Rhodope Mountains*. From the north-east of the Alps another branch runs south-east as the *Dinaric Alps* and the *Pindus Mountains* to southern Greece, reappears out to sea as the islands of Crete and Cyprus, and continues as the Taurus in Asiatic Turkey.

From the south-west the Alps send branches east and south-west. The eastward branch turns south-east through Italy as the *Apennines*, and then south until broken by the Straits of Messina. This branch reappears in Sicily but is again broken by the sea, after which it rises again as the *Atlas Mountains* of North Africa. A branch of the Atlas turns north and, after being cut by the narrow Straits of Gibraltar, runs east-north-east as the *Sierra Nevada* of southern Spain, and is also in evidence in the Balearic Islands. The south-west branch is broken at the Gulf of Lyons, and reappears as the *Pyrenees* running west with a continuation known as the *Cantabrian Mountains* to the western seaboard of Spain.

West of the Alps, and separated therefrom by the Rhône valley, is the *Central Plateau* of France, comprising the *Cevennes* and the *Auvergnes*. The *Spanish Meseta* is a plateau covering the whole of central Spain. West of the Carpathians is the *Bohemian Plateau*, enclosed by the *Riesen Gebirge*, the *Erz Gebirge* and the *Bohmer Wald*. The Alps, the Carpathians, the Transylvanian Alps and the Dinaric Alps enclose the *Hungarian Plain*, whilst between the Transylvanian Alps in the north and the Balkans in the south lies the *Wallachian Plain* of Rumania. In northern Italy, south of the Alps, lies the *Plain of Lombardy*, formed by the valley of the River Po.

Geological Formation

Scandinavia, Finland and the Highlands of Scotland are largely covered with a mass of ancient crystalline rocks. The Great European Plain is formed of sedimentary rocks which lie in almost horizontal layers and which have been for the most part undisturbed. The remainder of Europe has a complex geological history. In the south are the young fold mountains, and between these and the plain lies a complicated system of block mountains and basins, originally part of a system of fold mountains but subsequently worn down. The basins (such as the London Basin, the Paris Basin, the Bordeaux Basin, the lower Rhine Basin and the lower Weser Basin) have been filled by deposits of sedimentary rocks, whilst the mountain blocks comprise the uplifted areas of later earth movements.

During the Glacial Period a large part of northern and north-west Europe was covered by ice, and as a result the soil over a considerable area consists of the deposits brought by the ice-sheet. These deposits exist to-day in the form of boulder clay in the once ice-covered regions, but away from these regions there are lighter deposits which have been carried thither by the action of wind and water and now cover such places as southern Russia, north-western France, Rumania and Hungary. These areas, in distinct contrast to other parts of Europe, are very fertile and in Russia, Rumania and Hungary they have been rendered more fertile by an admixture of humus.

Rivers of Europe

The eastern European rivers are longer than the western ones, and, as they are nearly all snow-fed, they tend to be low in winter and high in early summer, when the ice and snow melt. In south-central Europe the only long river is the Danube. With the exception of the rivers of European Russia, which rise in the Valdai Hills or the Urals, all the principal European rivers have their source in the Southern Highlands.

The eastern rivers are generally slow, are obstructed by ice in winter, and in many cases flow to inland seas, a fact which restricts their importance. The *Volga* and *Ural* flow into the Caspian Sea; the *Don*, the *Dnieper*, the *Dniester* and the *Bug* to the Black Sea; the *Northern Dwina* to the White Sea; and the *Dwina*, the *Niemen* and the *Vistula* to the Baltic Sea.

In the Central European Plain, the rivers have a general north-west direction and are slow, but many are of considerable commercial importance and have busy seaports at their mouths. The *Oder* (Germany) flows to the Baltic, and flowing either to the North Sea or to the Atlantic are the *Elbe* (Czechoslovakia and Germany); the *Weser* (Germany); the *Rhine* (Germany and the Netherlands); the *Scheldt* (Belgium and France); the *Meuse* (Holland, Belgium and France); the *Seine*, the *Loire* and the *Garonne* (France).

The *Danube*, after leaving the mountains, drains the Hungarian and Wallachian plains. It flows to the east away from the busy industrial areas and into the Black Sea, but is nevertheless of considerable importance. The *Po* (Italy), which flows into the Gulf of Venice at the head of the Adriatic Sea, drains the southern slopes of the Alps and fertilises the rich alluvial Plain of Lombardy. The *Rhône-Saône* valleys make a lowland route from north-west and central Europe to the Mediterranean.

The rivers of the three southern peninsulas (the Iberian Peninsula, Peninsular Italy and the Balkan Peninsula) are short and rapid and are of no commercial importance with the exception of (*a*) certain rivers of Iberia—the *Douro*, the *Tagus*, the *Guadiana*, the *Guadalquivir* and the *Ebro* (all except the Ebro flowing west); and (*b*) the *Maritza* of the Balkans.

The Scandinavian rivers, with the exception of the *Glommen*, are short and rapid, but are valuable as sources of water-power and for the transport of timber from the inland forest areas to the mills and the river mouths.

European Lakes

The lakes of Europe may be divided into two main categories: (*a*) the Northern System of Finland, Estonia and eastern Scandinavia, and (*b*) the Alpine System.

THE NORTHERN SYSTEM. The lakes of this system were formed by the settlement of water in hollows scooped out by glaciers. The most important are Lakes *Wetter* (or Vätter) and *Wener* (or Väner) in Sweden; Lake *Peipus* in Estonia; Lakes *Ladoga* and *Saima* in Finland; and Lake *Onega* in European Russia.

THE ALPINE SYSTEM. These lakes were formed in hollows created by glacial action or in river valleys which have been dammed by the débris from glaciers and avalanches. Included in this system are *Lake Neuchâtel*, *Lake Lucerne* and *Lake Zurich* in Switzerland; *Lake*

Geneva between Switzerland and France; *Lake Constance* on the border of Germany and Switzerland; *Lake Maggiore, Lake Como* and *Lake Garda* in Italy. Owing to their origin these lakes are long and narrow, while their picturesque setting and beautiful surroundings attract many visitors.

General Climatic Conditions

The climate of Europe is influenced by several factors, the most important being (1) latitude north of the Equator; (2) position on the western side of a large land mass; (3) proximity to the ocean on the west; (4) distance from the sea in the east; (5) the presence of the Mediterranean Sea in the south-west, and (6) variations in relief.

TEMPERATURE. The Continent lies wholly north of the Tropics, but the wide range of latitude causes a gradual increase in temperature from north to south. This is most apparent when the climate in the north of the Continent, which borders the Arctic, is compared with that of the areas bordering the Mediterranean Sea in the south, where the most southerly points lie little more than 10° of latitude from the Tropic of Cancer. The northern region has very long, cold winters and brief but mild summers, whilst in the extreme north the ground is covered with snow throughout the whole year. In the Mediterranean region, on the other hand, the winters are mild and the summers hot. The Mediterranean lands, in addition to lying in low latitudes, are also influenced by the Mediterranean Sea and in winter are protected from cold northerly winds by the mountain ranges which radiate from the Alps.

The situation of the Continent to the west of the great land mass of Asia has an important influence on its climate, and the modifying influence of the ocean in the west is one of the main factors which account for the differences between the climate of Europe and that of Asiatic countries in corresponding latitudes. This is particularly the case in the lands immediately adjacent to the Atlantic Ocean in the west. As we have observed in an earlier Chapter, the variations in temperature of the waters of the ocean are not as rapid or as marked as those which occur on land, so that the nearness of Western Europe to the Atlantic tends to give this region a much smaller range of temperature than is the case in those regions situated farther from the sea.

A further important factor is that the Continent is under the influence of the Westerly or S.W. Anti-Trade winds which, blowing from the west or south-west, in winter carry the warmth of the ocean over the land and also drive the warm ocean currents towards the shores. The western areas naturally receive the full benefit of these influences, the extent of which is clearly indicated by the direction of the isothermal lines (Fig. 155). Thus, the winter isotherm of 32°F. reaches as far south as the Black and Caspian Seas in the east, whilst in the west it rises to southern Iceland and the north of Norway. In the west, therefore, the isotherms tend to run in a north-south direction, but away from the west coast they tend towards the horizontal, running generally from

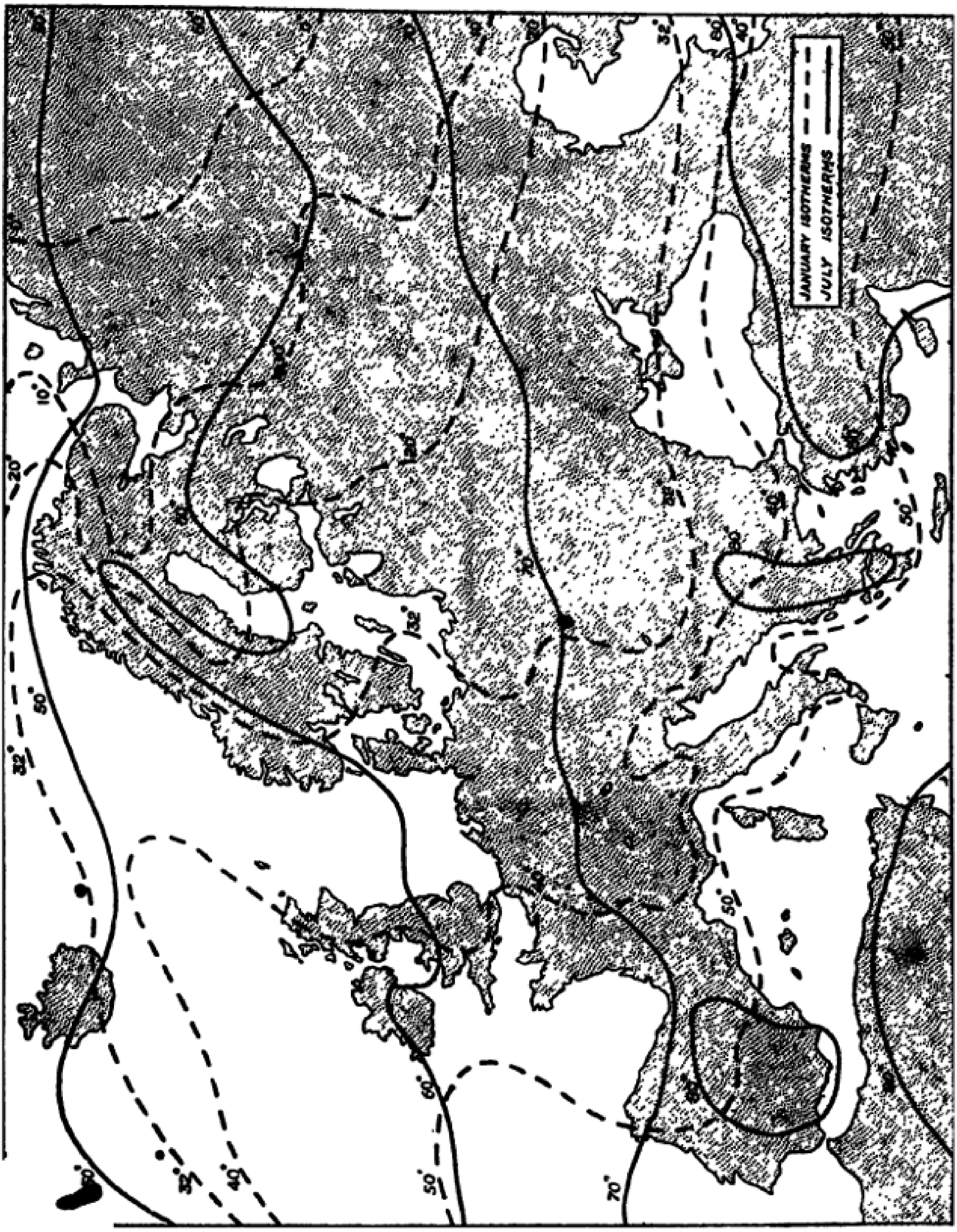


FIG. 155: EUROPE—TEMPERATURE IN °F. REDUCED TO SEA-LEVEL.

north-west to south-east, thus illustrating the fact that sea influences give Western Europe a much warmer winter climate than that experienced by the eastern parts of the Continent in the same latitude.

The coldest area in winter is in the north-east, which is farthest away from the sea influences and has the highest latitude. Conversely the warmest part is the south-west of the Iberian Peninsula, which lies in low latitudes and is also subject to marked sea influences.

The relief of the land naturally causes contrasting conditions even over comparatively small areas. In winter the west of England and the west coast of Scandinavia are warmer than the east of those countries, because in both cases the western areas receive the full benefit of the winter ocean warmth, whereas the eastern areas are robbed of that benefit by the mountains which lie between them and the sea. Central and southern Europe, again, are open to the cold northerly winds during the winter, and so experience very low temperatures at this time. In the Mediterranean region, however, the winter isotherms have a general west-east direction, as the variations in temperature from west to east in this area are less marked than elsewhere owing to the influence of the Mediterranean Sea.

In summer, the westerly winds have a moderating influence in the reverse direction. They carry the cool air from over the ocean to the western margins of the Continent and so counteract any tendency towards high temperature in those areas. This influence decreases inland, however, so that temperature increases from west to east, the summers in the east being hot, whilst in the western margins they are warm. Thus, the summer isotherms over Europe have a more nearly east-west direction than the winter isotherms, and the cooling influence of the sea at this period can be observed by the north-east swing of the isotherms in the regions away from the sea. The isotherm of 60°F., for example, passes through central Ireland, whilst in eastern Europe the isotherm of 70°F. reaches the same latitude.

The warmest parts of Europe in summer are in the south and the south-east, which experience off-shore winds from the heated interior, whilst the coolest parts are the north and the north-west, the former mainly because of its higher latitude, and the latter as a result of the influence of the sea. The effect of the sea is strikingly illustrated by the sharp bend of the isotherms to the north over Scandinavia.

These considerations show clearly that the general effect of sea and wind influences on Western Europe is to give this region a small range of temperature. Temperature from west to east, on the other hand, varies as a result of increasing distance from the sea, for regions situated inland are robbed of nearly all the moderating influences of the sea which make themselves felt on the lands further west. The general result, as shown by Fig. 155, is that temperature decreases from west to east in winter and increases from west to east in the summer months, so that eastern Europe has an extreme type of climate, cold in winter and hot in summer, as compared with the equable or oceanic climate of the west. This extreme type of climate is accentuated by the lack of any climatic barrier to protect the inland areas from the cold, northerly winds in winter and from the warm southerly winds in summer.

RAINFALL. The greater part of Europe (the exception being the southern part of the continent) has a rainfall régime characterised by irregularities of seasonal distribution. Western Europe naturally receives its rainfall from the Anti-Trades which, coming over the ocean from more-southerly latitudes, are moisture-laden, and which, on coming into contact with the cooler land surfaces of more northerly latitudes, are forced to give up their moisture as rain. The bulk of the rainfall received by Western Europe is brought by cyclonic storms.

The greatest rainfall, on the whole, occurs in the autumn, for at this period the land is cooling rapidly whilst the sea still retains much of its summer warmth. As a result, evaporation from the sea at this period is almost as great as in the summer months, whilst the rapidly cooling land surface causes greater condensation. The amount of rainfall naturally decreases from west to east until in the east of the Continent rain falls mainly in the summer and even then it is very light.

The regions receiving most rain in winter are the western parts of Scandinavia, Britain, France and Iberia, whilst it is at this period that the Mediterranean lands receive their annual rainfall from the Anti-Trades. In the interior of the Continent, high pressure conditions obtain at this period so that the cyclones cannot be carried far inland and a low rainfall results, being negligible and in the form of snow in the most easterly regions.

In summer, as in winter, the west and north-west again have the heaviest rainfall, but the amount is less than that occurring during the autumn and winter months. The grasslands in the east of the Continent receive most of their rain in summer as the low pressure area over southern Russia draws the winds much farther in than they are able to penetrate in winter, when high pressure conditions prevail over that region.

The most interesting feature of the distribution of summer rainfall in Europe is the lack of rain in the Mediterranean lands. At this period, owing to the yearly swing of the pressure belts and wind systems, the Mediterranean region lies in the tropical high pressure belt which encircles the globe north of the Tropic of Cancer. Hence, the Trade winds at this time prevailing over the Mediterranean lands are blowing from the land towards the low pressure area at the Equator and, therefore, not only bring no rain but also take up moisture from the lands [illegible]r which they pass.

The foregoing are the general factors influencing the rainfall of Europe, but it must be understood that the amount of rainfall received by different parts of the Continent necessarily varies with differences in relief. Thus, the Highlands of Scandinavia cause Norway to receive a heavier rainfall than Sweden, which lies to the east of the mountains and so in their rain-shadow. Again, variations are produced to the south of the Alps and Pyrenees owing to the influence of the Mediterranean Sea and to the relief of the southern peninsulas.

Climatic Regions

In the light of the foregoing considerations, we may divide Europe into five main climatic regions, *viz.*, (1) The Cold North ; (2) the Western Marginal Region ; (3) the Central Inland Region ; (4) the Eastern Inland Region ; and (5) the Southern or Mediterranean Region.

1. THE COLD NORTH constitutes part of the cold desert known as the Tundra, the main characteristics of which have been given in Chapter 9.

2. THE WESTERN MARGIN includes the British Isles, Scandinavia, Denmark, the greater part of Germany, Holland, Belgium, France (except the extreme south-east) northern Portugal and north-west Spain. Here the rainfall is fairly evenly distributed throughout the year (from 20–40 inches annually), but is slightly heavier in autumn and winter, and also in the coastal margins and highland areas.

Owing to the proximity to the sea of countries in this region, the mean annual range of temperature is comparatively small, being generally less than 30°F. The Gulf Stream Drift (or North Atlantic Drift) and the Westerly winds which blow over it have a modifying influence on the winter temperature of the coastal regions, and in some parts the winds bring warmth some distance inland as, for example, in the British Isles. If the land is mountainous, however, these influences do not greatly modify the climate, though they may have the effect of keeping the ports ice-free, as, for example, on the coast of Norway.

3. THE CENTRAL INLAND REGION, or central Europe, embraces east-central Germany, Poland, Czechoslovakia, Austria, Hungary, and Rumania. This region has its maximum rainfall in summer, with an average yearly fall of about twenty inches. The precipitation in the highlands is rather heavier than elsewhere. The extremes of temperature are wider than on the western margin owing to greater distance from the sea.

4. THE EASTERN INLAND REGION, by reason of its inland situation, has a continental type of climate with very low rainfall and extremes of temperature. The rainfall is confined almost entirely to the summer months and averages only about twelve inches per year, whilst the extremes of summer and winter temperatures are more marked than in any part of the Continent.

This region may be sub-divided into (i) *North-East Europe,* which lies immediately south of the Tundra, and includes the greater part of Finland, northern Sweden and northern Russia, and which has very cold winters, very short warm summers and light summer rainfall ;

(ii) *East-Central Europe*, including Central Russia and the Baltic States, which has very cold winters but warmer, wetter and longer summers than the north-east region; and (iii) the *extreme South-East of Europe*, or southern European Russia, where the greatest extremes of climate occur owing to great distance from the sea, but where the rainfall is still light with a summer maximum.

5. THE MEDITERRANEAN REGION consists of the lands surrounding the Mediterranean Sea. Here, as we have seen, the rainfall is confined almost entirely to the winter months and the average precipitation is under twenty inches per annum, although, in such areas as the Apennines and the Dinaric Alps, the rainfall is naturally somewhat greater. Owing to the southerly latitude and proximity to the sea, the annual range of temperature is not very great, the winters being warm or cool and the summers hot, with clear skies.

Vegetation Regions

The vegetation regions of Europe correspond largely to the climatic divisions, with modifications due to differences in relief. They fall conveniently into six groups: (1) Tundra; (2) Mountain Regions; (3) Coniferous Forest Region; (4) Deciduous Forest Region; (5) Grassland and Steppe Region, and (6) Region of Evergreen Trees and Shrubs.

In considering this division it is necessary to bear in mind that, though the natural vegetation in certain areas of Europe may be forest, much of it has been cleared, mainly as a result of the high density of population consequent on industrialisation. This is particularly true of the British Isles, parts of Germany, northern France and southern Belgium.

1. TUNDRA. Reference should be made to Chapter 9 for the typical vegetation of the Tundra region.

2. MOUNTAIN REGIONS. Here the vegetation varies according to altitude. In the highest parts the soil is barren, the rock is bare, and conditions generally are too severe for much vegetation, permanent snow being a common feature. Immediately below the snow line. as, for example, in the higher parts of the Alps, sparse Alpine flora form the sole vegetable growth. Next follows a belt of grassland or of small trees and shrubs, below which lie coniferous trees and, still lower, trees of the deciduous type.

3. CONIFEROUS FORESTS. This region extends across Norway, north Sweden, Finland and northern Russia (*see* Fig. 114 in Chapter 13), while other areas with similar characteristics exist in the Black Forest, the Vosges and the Caucasus Mountains, where the altitude compensates for the lower latitude.

The conifers include pines, firs, hemlock and larch, but intermingled with these is the birch, a deciduous tree. Lumbering is an important industry in the accessible parts; in the south, flax for fibre and rye are cultivated, while cattle and sheep are reared. Elsewhere the hunting of deer and fur-bearing animals is the only occupation.

4. DECIDUOUS FORESTS. This region lies to the south of the coniferous forest area and extends from the British Isles across almost the whole of western and central Europe. It is composed of alternating areas of broad-leaved forest and meadow land. Oak, beech, elm, maple and birch are the predominant trees, but, though much of the land has been cleared, the standing forests are being developed.

The deciduous forest region is the one most suited to the growth of temperate food crops, so that agriculture is an important industry and cereals, fruits, root crops, flax (for seed and fibre) and hemp are cultivated. Cattle and sheep rearing also is important. Where the land is not under cultivation great industrial regions have sprung up, based on the minerals (especially coal and iron) derived from the older blocks of land.

5. GRASSLAND AND STEPPES. This region lies chiefly in eastern Europe where the rainfall is too scanty for forest growth. The steppe lands are a region of tall undeveloped grasses, where agriculture is not sufficiently profitable to supplement the herding of vast flocks which at present roam the plains.

In the extreme east of this region, around the northern coast of the Caspian Sea, is an area of semi-desert characterised by a low rainfall and by salty, alkaline soils deposited by the retreating sea. The vegetation here is naturally very poor, for the soil can support only coarse and scattered herbs and bushes, whilst other large areas are covered only with reed swamps.

6. EVERGREEN TREES AND SHRUBS are characteristic of the Mediterranean lands. This is a great fruit-growing region, especially for those fruits with tough, drought-resisting and heat-resisting coverings, *e.g.*, the orange and the lemon. Other fruit crops include figs, currants, grapes. nuts, almonds, walnuts, chestnuts, black mulberries and pomegranates. The usual temperate cereals are grown in certain districts with the aid of irrigation, and the mountain slopes provide cork oak, chestnut, beech and other trees.

Natural Regions

In order satisfactorily to divide Europe into natural regions, it is necessary to combine what we have already learnt of the relief, climate and vegetation of the continent. The influence of these factors in any particular area is not equal, for some regions may exhibit marked characteristics of one of the factors only, whilst in others all three factors may be strongly in evidence. A further point is that the regions are not always distinctly separated—indeed, natural regions very rarely are.

The main physical divisions of the continent may be taken to form the basis of a regional classification, and, by dividing and sub-dividing

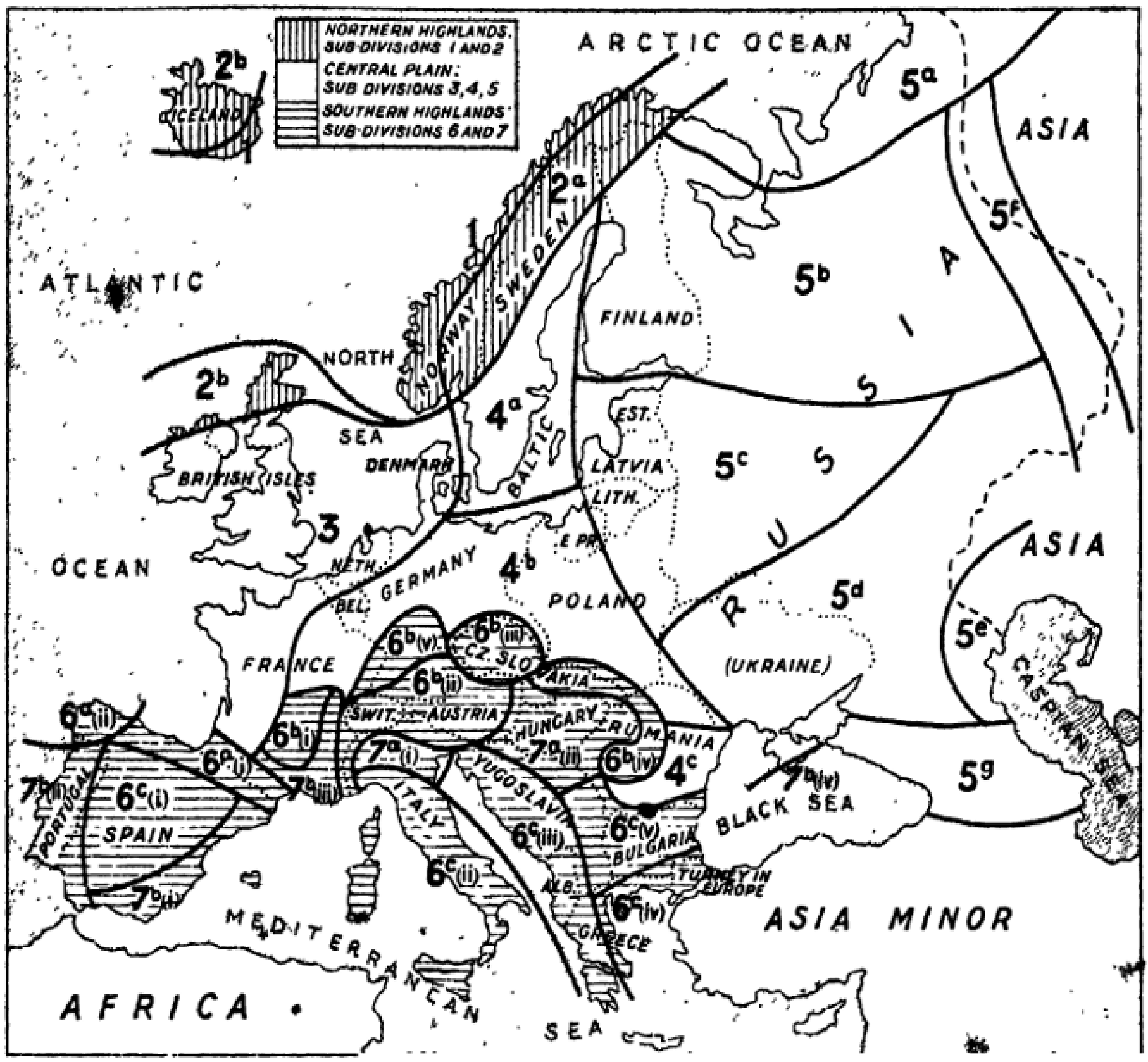


FIG. 155A: NATURAL REGIONS OF EUROPE.

the physical regions according to climatic and vegetation characteristics, we can classify the Continent into broad natural regions, as follows—

Northern Highlands.

1. THE WEST COAST OF SCANDINAVIA.
2. THE HIGHLAND REGIONS, sub-divided into—
    (a) *The Scandinavian Highlands.*
    (b) *The Scottish Highlands.*

tral Plain.

3. THE WESTERN MARGIN.
4. THE CENTRAL REGION, sub-divided into—
    (a) *The North-Central Region.*
    (b) *The Central Region proper.*
    (c) *The South-East Central Region.*

5. THE EASTERN REGION, sub-divided into—
    - (a) *Tundra.*
    - (b) *North-East Europe.*
    - (c) *East-Central Europe.*
    - (d) *South-East Europe.*
    - (e) *Caspian Depression.*
    - (f) *The Ural Mountains.*
    - (g) *The Caucasus Mountains.*

Southern Highlands.

6. THE HIGHLAND REGIONS, sub-divided into—
    - (a) *The North-West European Region*, comprising
        - (i) The Pyrenees and Cantabrians.
        - (ii) North-West Iberia.
    - (b) *The Central European Regions*, including
        - (i) The Central Plateau of France.
        - (ii) The Alps.
        - (iii) The Bohemian Plateau.
        - (iv) The Carpathians.
        - (v) South-Western Germany.
    - (c) *The Mediterranean Region*, including
        - (i) The Spanish Meseta.
        - (ii) Peninsular Italy.
        - (iii) The Western Balkans.
        - (iv) The Eastern Balkans.
        - (v) The North-Eastern Balkans.
7. THE LOWLAND REGIONS, sub-divided into
    - (a) *The Central European Regions*, including
        - (i) The Po Valley.
        - (ii) The Hungarian Plain.
    - (b) *The Mediterranean Regions*, including
        - (i) East and South-East Iberia.
        - (ii) South-West Iberia.
        - (iii) The Rhône Valley and the Riviera.
        - (iv) The Southern Slopes of the Crimea.

West Coast of Scandinavia

This region comprises the well-known fiord coast of Norway, famous for its prolific fisheries of cod and herring and for the numerous islands that fringe the coast. The region lies in the " winter gulf of warmth " so that it has a mild climate in relation to its latitude, whilst the rainfall is abundant and the winter very long. The mountain slopes yield plentiful supplies of softwoods, and lumbering and its attendant occupations provide valuable exports.

Northern Highlands

THE SCANDINAVIAN HIGHLANDS consist of a high plateau with a climate and vegetation of the Tundra type over most of the area. Where the rivers have carved steep valleys in the mountains, timber and pasture land cover the slopes and valley bottoms. The chief wealth of the region lies in its minerals and available water power.

THE SCOTTISH HIGHLANDS resemble the Scandinavian Plateau except that, owing to lower latitude, the climate is not so severe, whilst the mineral wealth is negligible. Sheep, cattle, game and deer are reared, and the east coast supports a small agricultural and fishing community.

In the north of Ireland the Northern Highlands are continued westwards in the Plateau of Antrim and the Mountains of Donegal, Mayo and Connemara. These have much the same characteristics as the Scottish Highlands.

ICELAND, the greater part of which is Tundra, is also included in this region.

Western Margin of the Central Plain

Included in this region are the British Isles, excluding the Scottish Highlands, and the western coastal margins of the Continent from Denmark to southern France. The climate is typically oceanic, as the region is under the influence of warm ocean drifts and in the track of the Anti-Trades and their accompanying cyclones throughout the greater part of the year. Further, as the wind is from the west and the higher land also lies mainly to the west, western areas are wetter and more equable than the eastern parts. Over the whole area the occupations have little relation to the natural vegetation of deciduous forests, as the latter have been cleared, and industrial pursuits based on the great mineral wealth, together with mixed farming, are predominant.

Central Parts of the Central Plain

THE NORTH-CENTRAL REGION comprises the lowlands of Sweden, cut off from oceanic influences by the Scandinavian Highlands. The winters are cold, the ports being frozen during the winter months, whilst the rainfall is relatively light. In the north, coniferous forests provide material for an important lumber industry, whilst the south is occupied with mixed farming, especially dairying. There is also much mineral wealth and abundant water-power.

CENTRAL EUROPE extends from the Baltic in the north to the Bohemian Massif in the south, and from eastern France and Denmark in the west to the Baltic States and the Black Sea in the east. The main characteristics of this region have already been dealt with in describing the climatic and vegetation regions (see pp. 336 and 338).

THE SOUTH-EAST CENTRAL REGION corresponds approximately to the Wallachian Plain of Rumania. Here, as a result of distance from the sea, the climate is extreme and the rainfall low. The characteristic vegetation is therefore of the steppeland or grassland type. The soil is fertile and the cultivation of cereals is the principal occupation.

Eastern Margins of the Central Plain

The Tundra occupies the extreme north of this region.

North-East Europe lies south of the Tundra and extends from the Baltic in the west to the Ural Mountains in the east. It is characterised by extensive coniferous forests. (See pp. 336 and 337).

East-Central Europe has less severe winters and hotter summers than the north-east and its vegetation is mainly of the deciduous forest type, but over most of this area, also, the forests have given way to agriculture. (See pp. 337 and 338).

South-East Europe has a dry, extreme climate. It occupies the south of European Russia and is a grassland or steppeland region, with agriculture as the chief occupation in the north and pastoral occupations in the south.

The Caspian Depression is referred to on p. 386.

The Urals and the Caucasus. The Ural Mountains, as we have seen, form part of the boundary between eastern Europe and western Asia, whilst the Caucasus Mountains lie in the extreme south of European Russia between the Black Sea and the Caspian Sea. They are important for their mineral wealth, oil being obtained from the Caucasus and gold, copper, iron and other minerals from the Urals. Both regions have large forested areas which have been little developed.

The Highland Regions of Southern Europe

The Pyrenees and the Cantabrians occupy the extreme north of the Iberian Peninsula. They have abundant rainfall and are covered with forests except in the highest parts, some of which are pasture lands supporting sheep and cattle during the summer months, whereas others are almost bare of vegetation. The Pyrenees form an effective barrier between France and Spain, whilst the Cantabrians are noted for their coal and iron deposits.

North-West Iberia has a typical West European or oceanic type of climate, and therefore the natural vegetation is deciduous forest and pasture land. The main occupations are fishing and the rearing of cattle.

The Central Plateau of France is sufficiently high to experience a heavier rainfall and colder winters than the surrounding areas. It consists of old rocks with numerous extinct volcanoes and a poor soil. The chief occupations are connected with the small coal and iron fields centred on industrial areas at St. Etienne, Le Creuzot, Clermont-Ferrand, and other towns. The richest parts agriculturally are the valleys and the black volcanic soil areas. Some rye is produced and sheep are reared.

The Alps. In common with all high mountainous regions, the vegetation of the Alps varies with altitude. The highest parts belong to the Tundra type of region, whilst the lower slopes and valleys facing north are akin to the Central European regions and those facing south to the Mediterranean regions.

The Bohemian Plateau is surrounded by highlands and has a continental type of climate, with a low rainfall. The north has a fertile soil and rich deposits of minerals, whilst the southern highlands are forested.

The Carpathians, including the Transylvanian Alps, are covered with forests, mainly of beech and oak.

South-Western Germany is a well-forested plateau region with a continental climate. Only in the sheltered river valleys is agriculture possible, the chief crops being oats, barley, hops and the vine.

The Spanish Meseta, or Iberian Plateau, is not a true Mediterranean region because, as a result mainly of altitude, the climate is more extreme than that of the typical winter rain regions, whilst the soil over large areas is infertile and the vegetation mainly of the semi-desert type. The central parts of the region, however, are more fertile.

Peninsular Italy is mainly a highland region and is not very fertile. Some of the coastal areas, particularly the west, which has the heaviest rainfall, grow typical Mediterranean products. The summers are dry, but the whole region receives adequate rain in winter. Some parts are unhealthy and swampy, but some of the swamps have been drained and made productive. In the northern Apennines the famous Carrara marble is quarried.

The Balkans. The *Western Balkans* have a high rainfall because they lie on the windward side of the mountains, but the nature of the surface does not permit of any great fertility. The lowlands and valleys, however, yield the type of products associated with the Mediterranean regions. The *Eastern Balkans* are much drier as they are in a rainshadow area. The surface is much broken and not very fertile, but the lowlands produce Mediterranean crops under irrigation. The *North-Eastern Balkans* have a continental type of climate owing to the mountainous nature of the region, and are fitted only for pastoral farming.

Lowland Regions of Southern Europe

The Plain of Lombardy, or the Po Valley, is similar to the Spanish Meseta, in that it has a more extreme type of climate than the true Mediterranean lands as it is sheltered by mountains from the influence of the Anti-Trades, though the rainfall is more nearly Mediterranean. Nevertheless, this is one of the most fertile parts of Europe, the soil being rich alluvium deposited by the River Po and its tributaries. Irrigation is practised and many Mediterranean products are produced, a notable exception being the olive. There is also considerable industrial activity based on the water power resources of the Alps.

THE HUNGARIAN PLAIN is divided by the Bakony Wald, to the west of Budapest, into a small upper region and a much more extensive lower plain to the east and south. The whole region is enclosed by mountains and has a continental type of climate, with a low summer rainfall. The upper plain is better watered than the lower, but the greater part of the whole region is fertile, covered with loess, alluvium and black-earth soils. The natural vegetation is of the steppeland type and agricultural pursuits predominate, wheat and maize being the chief crops.

EAST AND SOUTH-EASTERN IBERIA. This region has a dry Mediterranean type of climate as it lies in the rainshadow area of the plateau. Irrigation is of great importance and is widely practised, with the result that fruits (such as grapes and olives), cereals, root-crops, hemp and a little rice are cultivated.

SOUTH-WEST IBERIA is really a transition-region between the oceanic and the Mediterranean region but, owing to its latitude, its temperature more nearly approximates to the latter type of region, though the rainfall is not confined to the winter months because of the proximity of the sea and the influence of the Westerlies. The lowlands produce Mediterranean fruits, wine being an important export. In some parts the cultivation of cereals and the rearing of cattle are important.

THE RHÔNE VALLEY AND THE GULF COASTAL LOWLANDS, enclosed by the Alps to the east and the French Plateau to the west, have a typical Mediterranean climate reinforced by the effects of a southern slope. The most fertile areas are found in the Rhône Valley, where the vine and the mulberry are highly important products. To the east of the Rhône delta is the "Riviera," one of the playgrounds of Europe.

THE SOUTHERN SLOPES OF THE CRIMEA are backed by a ridge of highland which protects them from cold winter winds experienced by the lands to the north and effectively removes the region from the East European climatic group. The southerly aspect of the slopes, together with a sufficient rainfall, enable this region to produce Mediterranean fruits and to grow trees such as the walnut and the chestnut.

Minerals

Europe is well supplied with minerals, particularly those which are specially important in modern industry, such as coal, iron and copper. The minerals are, however, very unevenly distributed. Some countries, notably Denmark and Italy, are almost without minerals, whereas there are abundant supplies in Great Britain, Germany, France, Czechoslovakia and Spain. The precious metals are somewhat scarce, but *gold* is obtained from the Urals and *silver* is found in the Harz Mountains (Germany), in the Black Forest and in Spain.

Coal and *iron* are frequently found in adjoining areas, but some districts have rich beds of iron ore which must be sent elsewhere for smelting because of the absence of coal. Coal and iron are found together in Britain, Germany, north-east France, southern Belgium, Czechoslovakia and European Russia ; but the iron deposits of Sweden and Norway lie in localities which have no coal supplies and the ore is therefore largely exported to the coal-producing countries.

In addition to coal and iron, a considerable amount of *copper* is found in Germany, Yugoslavia and Spain, whilst *lead* is mined not only in the same districts as silver but also in the British Isles. *Sulphur* is present in the volcanic regions (Iceland, Italy, Sicily) ; *salt* in Central Europe and the British Isles ; and *petroleum* in the south-east of European Russia and in Rumania. *Building stones* and *clay* are widely distributed, except in the plains, while *mercury* is found in Italy and Spain.

Communications

RIVERS. From a very early period rivers have been an important means of communication throughout Europe. The Russian rivers, as we have seen, are slow, and are navigable for small vessels, but they are mostly frozen in winter and empty themselves into seas which are either ice-bound or land-locked. Owing to these impediments and to the fact that these rivers do not flow through any densely populated areas, their value as means of communication is of local importance only. The *Volga* needs special mention, however, for it is navigable in summer for over 2,000 miles and its tributaries and connecting canals give it communication with the White Sea, the Baltic, the Gulf of Finland and with other Russian rivers such as the *Don*, *Dwina*, *Dnieper* and *Dniester*. During the winter months, on the other hand, navigation is impossible, whilst shoals and banks impede navigation in parts of the course.

The rivers flowing from the Alps form great highways between the coasts and the interior, and have been used for transport from the earliest times of water navigation.

The *Danube* is the one great *eastward*-flowing river of the mainland. Rising in the Black Forest, it flows through comparatively high land until it reaches Passau, where it is joined by the *Inn*. From there, its valley widens out to the plain of which Vienna is the centre. Thence it flows to Bratislava, at its junction with the March. The river then utilises the *Carpathian Gate*, to break through the outlying folds of the Alps and Carpathians, turns south to Budapest, and flows across the great plain of Hungary, turning east again just north of lat. 45°N. to reach Belgrade, where it is joined by the *Save*. The Danube is the one great natural route through this fertile area, which it leaves through the Iron Gates, a natural gap between the Transylvanian Alps and the Balkans, and from this point it flows across the fertile plain of Wallachia. After traversing the plain, the river turns first north and then east to empty into the Black Sea through several mouths covering a wide delta. At the mouth of the main stream is Sulina, a port of the Black Sea. The Danube is navigable to Braila for ocean-going vessels, whilst 400-ton steamers can reach Ratisbon and 100-ton vessels can ascend to Ulm.

As the Danube passes through several countries, it has considerable international as well as national and local importance, and for this reason it was internationalised in 1919.

The *Seine* rises in the Côte d'Or in Burgundy (France), and flows north-west until it is joined by the *Aube* and south-west until it meets the *Yonne* at Montereau, whence it again flows north-west across the low plain to Paris, where it receives the *Marne* from the east. After leaving Paris, the main stream is joined by the *Oise*, and it then follows a meandering course through very low-lying plains to the English Channel *via* Rouen and Le Havre. Despite the lengthening of the journey by these meanderings, the river is much used, particularly for transporting foodstuffs, for its upper course serves the vine-growing districts of Burgundy and Champagne, whilst the lower plain is a fertile wheat-producing area.

The *Rhine* rises in Switzerland near the St. Gothard heights and flows through Lake Constance to Basel, which is the limit of navigation. Between Lake Constance and Basel it receives the *Aar* from the south. At Basel, the river turns north through the rift between the Vosges and the Black Forest, serving a rich agricultural and manufacturing district centred around Strasbourg. The river continues north, receiving the *Neckar* near Mannheim and the *Main* at Mainz (Mayence). This is a manufacturing district based on timber products, and is noted for such articles as toys, pianos and scientific instruments. Between Mainz and Bingen the river flows west, south of the Taunus range, and then forces a north-west passage between the Taunus and the Hunsrück to reach Coblenz, where it is joined by the *Moselle*, which flows through an important iron-mining and iron-smelting region.

The Rhine enters the European plain at Bonn, and, passing through Cologne and Düsseldorf, serves the great manufacturing region of the Ruhr coalfield with its huge steelworks, notably at Essen, Dortmund and Düsseldorf. The river then turns west and flows through Holland to its delta on the North Sea. The main arm of the delta is known as the *Waal*, which is joined by the *Maas* on the southern bank, and the united streams flow to Rotterdam as the *Noord*. Two other important arms of the delta are the *Lek* (which rejoins the Waal-Maas) and the *Yssel*, which runs due north to the Zuider Zee. A branch of the Lek, the *Vecht*, flows into the Zuider Zee near Amsterdam. The Rhine is a highly important north-south avenue of transport and communication. It is in constant use by small ocean vessels, which can easily reach Mannheim, whilst 400-ton vessels can ascend as far as Strasbourg.

The *Elbe* rises in the Sudetes, the north-eastern hills of Bohemia, and forms the chief outlet for the products of that country. It flows north-west between the Sudetes and the main Bohemian block to Dresden in Germany, receiving on its way the *Moldau*, on which stands Prague, capital of Czechoslovakia. From Dresden, the river crosses the plain *via* Magdeburg to Hamburg. The Elbe serves the manufacturing districts of Czechoslovakia and the beet-growing region of the German plain, and, like the Danube, has been internationalised. The river is navigable for ocean-going vessels only to Hamburg, but vessels of 400 tons are able to reach Prague.

The *Vistula* rises in the Carpathians on the borders of Czechoslovakia and Poland. After passing through Cracow it leaves the high land and flows first north-east and then north-west across the plain *via* Warsaw to Danzig on the Baltic. The valley is wide and fertile, the latter because the river frequently inundates the surrounding country. After leaving Warsaw, the river flows through an important agricultural region. The Vistula is navigable almost throughout its course, being specially valuable for this purpose as far as Cracow.

CANALS. The canals of Europe are used extensively. They generally join the various rivers or run parallel to them to relieve congestion and assist navigation. In European Russia, all the principal rivers are thus linked together, and it is possible to cross Europe from east to west by canal and river. This means of transport is extremely important on the great central plain—Germany, Belgium and France, in particular, having a vast network of waterways. (Refer to Chapter 19.)

RAILWAYS. The need for speedy communication between the highly important industrial and commercial centres in Europe has given rise to a vast network of railways spread over the Continent. The great obstacles to railway construction are mountains, rivers and marshes, and although Europe is, on the whole, well supplied with easy routes, some remarkable engineering feats have been achieved in order to overcome formidable physical obstacles between points previously not served by railway. A comparison of the communication and relief maps will show how the railways have taken advantage of the easy routes made by the river valleys and of the "gates" between blocks of high land.

With Paris in such a remarkably central position, it is not surprising to find that that city is the focus of many railway routes which are fed from all directions by sea, by canal, by road and by air. Lines of communication run from Paris north-east to the U.S.S.R., south to the Mediterranean and east to Istanbul, thus linking up the whole mainland (*see* Fig. 156 and Chapter 18).

AIR ROUTES. The principal air routes of Europe have been discussed in Chapter 19, to which reference should be made.

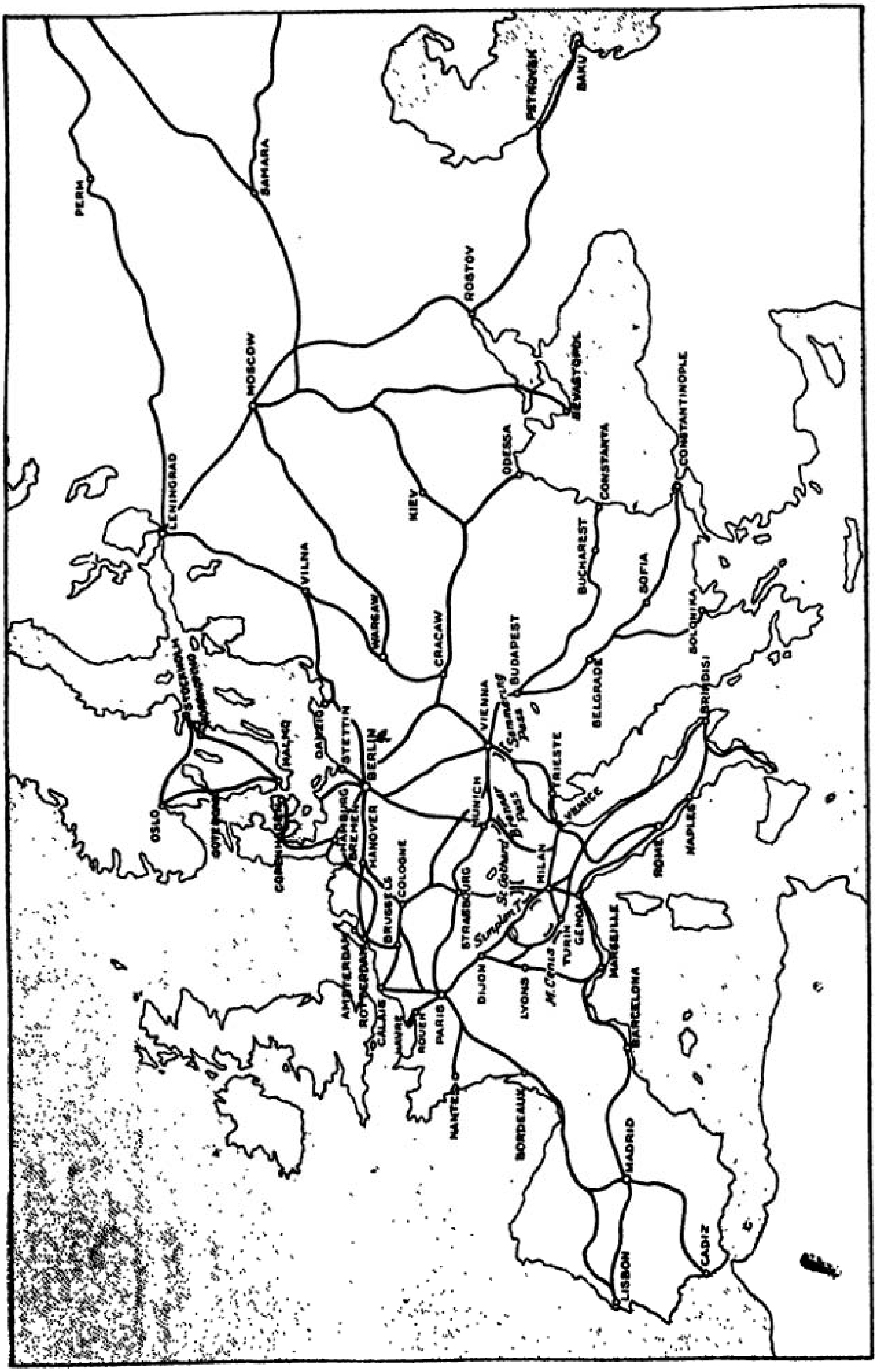


FIG. 156: EUROPE—RAILWAYS (SHOWING ALPINE PASSES).

Population

The original peoples of Europe came from Asia Minor, and the first area to be inhabited was the land around the Mediterranean Sea. To-day, however, the population is distributed all over the Continent. The areas of density are regulated by such factors as the distribution of minerals and the fertility of the soil. Where agriculture is predominant, as in France and Rumania, the population is fairly evenly distributed, and these areas support about 130 people to the square mile.

Mining and manufacturing districts have a much greater density; the Belgian, Polish, German and British coalfields, for instance, have over 500 persons per square mile. Other areas of dense population are the fertile plains and the textile manufacturing districts of the Po valley and the coastal strips of Italy, Holland, Portugal and northern and eastern Spain. On the other hand, upland regions such as the highlands of Scotland, Scandinavia, the Alps and the Carpathians are sparsely populated, having less than 26 persons per square mile.

THE RACES OF EUROPE are of three main types :—

1. *The northern Nordics*, a tall race with long skulls, narrow faces and light or fair hair and eyes.

2. *The Mediterranean* people, with a medium stature, dark hair, dark eyes, dark skins and broader noses than the Nordics.

3. *The Alpine* peoples of the centre, of medium height, broad stature, broad noses, flat faces and heads, light hair and hazel-grey eyes.

Languages and Religions

About fifty different languages are spoken by European peoples, the main divisions being :—

1. *Teutonic*, spoken in England, Scandinavia, Denmark, Germany, Austria, the Netherlands and Flanders.

2. *Slavonic*, spoken in European Russia, Poland, Czechoslovakia, Yugoslavia and Bulgaria.

3. *Romance*, spoken in France, Italy, Iberia, Rumania and southern Belgium.

Christianity is the predominating religion, the Catholic Church having the largest number of adherents, followed by the Greek Church, and then the Protestant. There are many other religions, including the Jewish, professed in Europe by some ten million people.

QUESTIONS ON CHAPTER 21

1. Give a brief account of the climate of Europe dividing Europe up into its major climatic regions. Note any peculiarities of vegetation which result from differences of climate. (*C.I.S. Prelim., Dec.,* 1931)
2. What parts of the continent of Europe are most densely populated? What factors have influenced the concentration of population in each of the regions you mention? (*C.I.S. Prelim., June,* 1930)
3. Give a short description of the climate of Europe. (*C.I.I. Associateship, Accident Branch,* 1928)
4. Write a short explanatory account of the seasonal distribution of rainfall in Europe (*O. and C.J.B.,* 1928)
5. Show, with the aid of sketch-maps, that two or more important routes across the main landmass of Europe converge on (*a*) the Gulf of Lyons, (*b*) the head of the Adriatic, (*c*) the north-western end of the Black Sea. (*L.M.,* 1928)
6. Show how the railway routes from Switzerland to Italy are related to the relief of the land. Draw sketch-maps to illustrate your answer. (*C.S.C.,* 1926)
7. Give an account of the physical geography of the Alps. (*L.M.*)
8. Into what distinct regions of natural vegetation may Europe be divided? State the position and point out the chief characteristics of each region. Account briefly for the differences in vegetation. (*O.S.L.*)
9. Describe and explain as far as you can the physical characteristics of the west coast of the mainland of Europe from Southern Norway to Brittany (excluding the Baltic coast). (*L.M.*)
10. In what parts of Europe do the inhabitants still lead a nomadic or semi-nomadic life? Account for this in each case. (*L.M.*)
11. Compare and contrast, as commercial highways, the river Rhine and the river Seine. (*I. of B., Qual.,* 1934)

CHAPTER 22

NORTHERN AND WESTERN EUROPE

SCANDINAVIA

Area: Norway, 124,556 sq. miles; Sweden, 173,350 sq. miles.
Population: Norway, 2,810,000; Sweden 6,200,000.

The Scandinavian Peninsula is situated in the extreme north-west of Europe, and comprises the *Kingdom of Norway*, which borders the North Atlantic Ocean, and the *Kingdom of Sweden*, bordering the Baltic Sea. The peninsula is separated from Denmark by the *Skagerrak*, the *Kattegat* and the *Sound*, three stretches of water leading from the North Sea to the Baltic Sea.

Relief

The peninsula is a tilted plateau composed of ancient rocks, with a steep slope to the North Sea on the west and a more gentle slope to the Baltic on the east. Consequently, the highest parts are in Norway, whilst the broader coastal plain lies almost entirely in southern Sweden. The Norwegian coast is much indented with fjords, whilst both this and the Swedish coast are fringed by numerous islands, the chief of which are the *Lofoten Islands* off the north coast of Norway, and the *Aland* and *Göttland Islands* in the Baltic.

The rivers of Scandinavia are important as a source of power, but are generally of little use for navigation, though a few of the Swedish rivers are navigable in the summer. Scandinavia possesses the second most extensive system of lakes in Europe, the three largest lakes—Lakes *Wener* and *Wetter*, both drained by the Göta river, and Lake *Mälar* on which stands Stockholm—being in Sweden.

Climate

Norway has an "oceanic" type of climate, with an evenly distributed rainfall, whilst Sweden has an extreme or "continental" climate with considerably less rainfall than Norway. These differences are due to the influence of the sea, to relief and to the slope of the land. Norway receives the full force of the Westerlies, which, having blown over the warm North Atlantic Drift, bring her both rain and warmth, whereas they are comparatively dry and cool when they reach Sweden after having passed over the mountain backbone between the two countries. These mountains also favour Norway in that they protect her from the cold north-east winds whereas Sweden is fully exposed to them (see Fig. 157), and is also subject to the cold influence of the Baltic, which freezes in winter. It is for these reasons that Swedish ports are frozen in winter whilst Norwegian ports on the west coast are open all the year round because of the influence of the North Atlantic Drift. The highest parts of the plateau region have a cold, inhospitable climate, but the lower slopes have a climate suitable to forest growth.

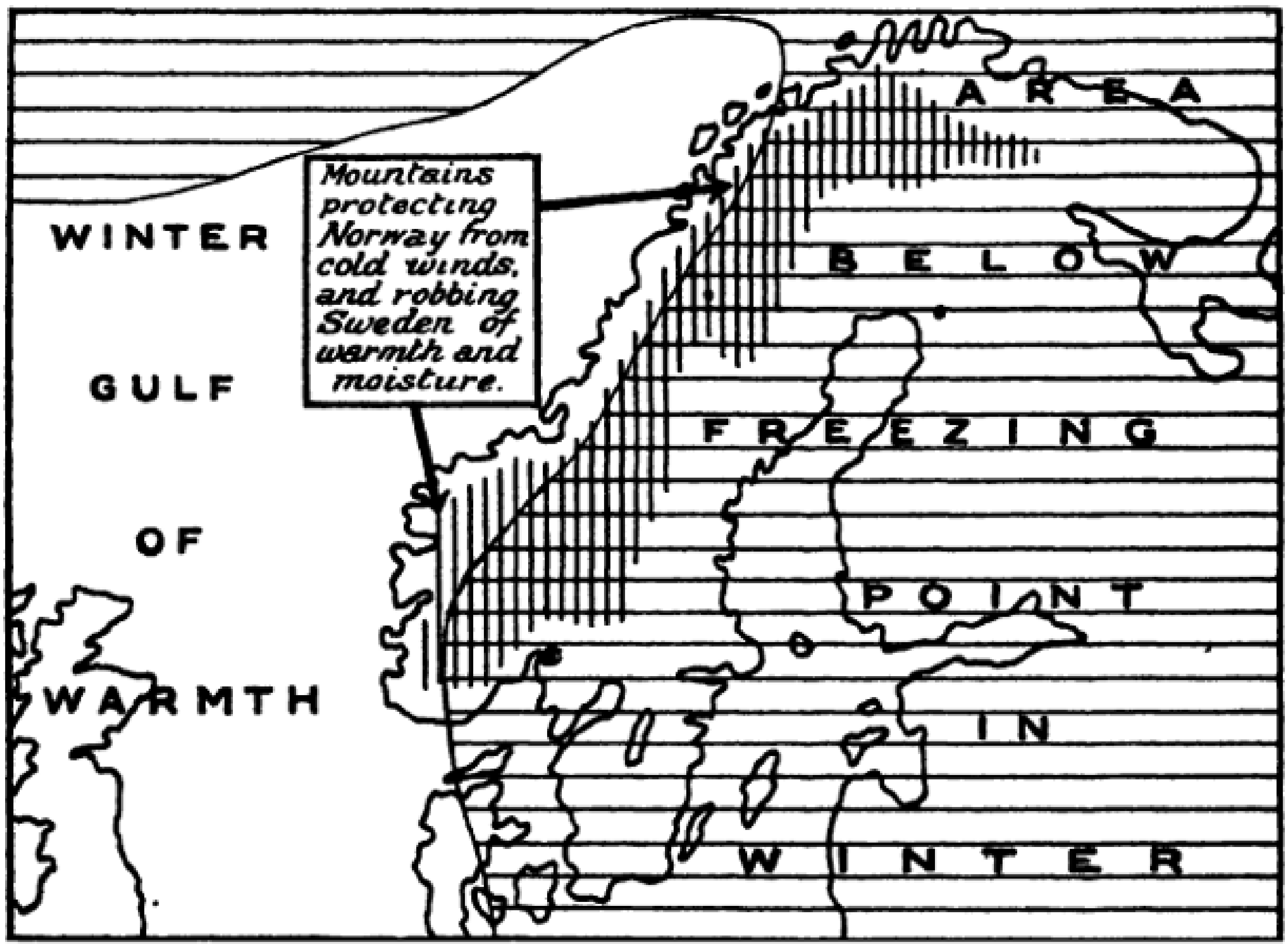

WINTER
GULF
OF
WARMTH
Mountains protecting Norway from cold winds, and robbing Sweden of warmth and moisture.
AREA
BELOW
FREEZING
POINT
IN
WINTER

Fig. 157: Scandinavia—Climatic Influences.

Industries of Norway

Forestry.—The Norwegian forests yield large supplies of timber, giving rise to the manufacture of wood-pulp, paper and wooden toys, and to the distillation of tar, wood-alcohol, acetone and acetic acid. (Refer at this point to "Timber", Chapter 13.)

Fishing.—Large quantities of fish are caught, mainly cod and herrings, the principal catches of the former being made off the Lofoten Islands and of the latter around the port of Bergen on the west coast.

Mining.—The mineral wealth of Norway is fairly large, but there is a lack of coal. Iron is found at Kragerö and Arendal, copper at Röros, silver at Kongsberg, and phosphorus ore at Stavanger, where the presence of the ore, aided by the plentiful supply of timber available, has given rise to a large match industry. Certain minor manufacturing industries, such as the working of copper and silver by electric furnaces and the production of calcium carbide and nitric acid (from atmospheric nitrogen), are favoured by the cheap supply of electricity generated by water-power.

Agriculture is unimportant owing to the relief. The chief food crop is the potato, whilst cattle and sheep are reared on the lower pastures, giving rise to the export of butter and condensed milk. Barley is widely grown but the home production is insufficient and has to be supplemented by imported supplies to feed the breweries of Oslo and Bergen.

Other Industries.—The Norwegians are essentially a seafaring people. The mercantile marine is large in view of the size of the country, and the carrying of produce for other countries is an important occupation. Shipbuilding, too, is growing in importance.

Natural Regions of Norway

Norway can be divided into three natural regions: (1) the West Coastal Plain; (2) the Highlands, and (3) the Oslo Plain.

The West Coastal Plain is very narrow and is extremely indented with fjords, being protected against the Atlantic by "the skerry guard," a fringe of small islands. The climate is typically maritime.

Oats and potatoes are the chief crops of the valleys, while, on the lower slopes to the east, pastoral farming is carried on, giving rise to a small export of dairy products.

Fishing is an important occupation, *Bergen*, *Stavanger* and *Trondhjem* being the chief centres, with minor ports at Tromsö and Hammerfest. Bergen has an important timber export to Newcastle and Hull. Round the Lofoten Islands, off the north-west coast, are important cod fishing areas.

The Highlands cover the bulk of the country and are important mainly for the timber they provide. The products of the timber region include wooden manufactures, wood-pulp, sawn wood and pit-props. *Röros* is the chief centre of the Norwegian pulp and paper industry.

Iron ores are abundant, but the best qualities are found in the south, near *Kragerö* and *Arendal*. Coal is lacking, but this is compensated for by the abundance of water power. The latter is important in the timber and allied industries, and in the chemical industry, which is fairly widespread.

The Oslo Plain consists of the valley of the Glommen. The climate is less equable than that of the west coast and the rainfall is heavier in summer than in winter.

Agriculture, including the production of oats, rye, potatoes and barley, and pastoral farming are important. Lumbering also is a leading industry, supplies of timber being transported from the highlands *via* the Glommen River.

Oslo, the capital of Norway, the chief administrative centre and port of the country, has large exports of timber, wood products and fish. (See also Chapter 16.)

Sweden's Industries

FORESTRY.—In Sweden also the main occupations are those connected with forestry, for 52 per cent. of the country is covered with trees. The rivers provide a ready means of transporting the timber and other products, while the water power from numerous falls is utilised in the saw, pulp and cellulose mills, particularly north of Stockholm. The distillation of wood spirit is an important industry while charcoal prepared from the forest timber is used in smelting local iron ores to make the finest steel.

MINERALS are plentiful. Iron is found at Dannemora and Gellivara; copper in the Dal basin; silver and lead at Sala; and zinc at Ammerberg. The abundance of iron ore of excellent quality has given rise to an important iron and steel industry, the products of which rank second to timber products in export value.

The iron and steel industries (which are favoured by the plentiful supplies of water power for the generation of cheap electricity) are centred at Stockholm (the capital, with 520,000 inhabitants—see Chapter 16); Norrköping (on the south-east coast), and Göteborg. Stockholm has an important shipbuilding industry, while Norrköping is noted chiefly for machinery.

AGRICULTURE is more important in Sweden than in Norway. Oats, rye, barley, potatoes and sugar-beet are cultivated in the centre and south. The barley is used in the widespread brewing industries, while sugar is made from the beets. Cattle are reared in the lowlands, providing a large export of butter as well as hides for the manufacture of boots and shoes. To provide winter food for the cattle, fodder crops and hay are extensively grown, occupying as much land as all the cereals.

MANUFACTURES not already mentioned include chemicals (based on cheap electricity produced by water power), cottons, woollens and explosives. The textiles are manufactured chiefly at Norrköping, Linköping and Göteborg, while matches are made at Jonköping.

The chief ports are Stockholm, Gotebörg and *Malmö*. The last named is an important packet station in the extreme south, while *Gotebörg*, situated on the Kattegat at the mouth of the Göta River, is not only the first port and second city of Sweden, but is also an important railway centre with good communications inland by both and canal.

Natural Regions of Sweden

Sweden can be divided into three natural regions: (1) the Highlands to the west; (2) the Baltic Lowlands in the north; and (3) the Southern Plain.

THE HIGHLANDS form a cold desert and are forested only on the lower slopes. Important deposits of iron ore are found at *Gellivara* and *Kirunavara*, the greater part being exported owing to the lack of local facilities for smelting. The ore is exported through the Swedish port of *Lulea*, in the Gulf of Bothnia, except in winter, when it is sent by rail to the ice-free port of *Narvik* on the west coast of Norway.

THE NORTHERN LOWLANDS, bordering the Gulf of Bothnia, are mainly forested.

THE SOUTHERN PLAIN is the most important part of the country and includes that part of Sweden lying south of Stockholm. The soil is fertile and produces oats, rye, barley, potatoes and sugar-beet. Pastoral farming also is prominent, there being important exports of butter, cheese and bacon.

The important towns already mentioned, Stockholm, Norrköping, Goteborg, Linköping and Jonköping, as well as the important iron field around Dannemora, are all situated in this region.

Communications

Owing to the lack of navigable rivers, transport in Scandinavia is effected chiefly by rail and coastal steamers. Railway lines run from Narvik, an ice-free port in the north of Norway, *via* Gellivara in Sweden to Lulea on the Gulf of Bothnia ; from Trondhjem, an important Norwegian port on the west coast, to Lulea in the north and Stockholm in the south ; from Stockholm to Malmö and to Goteborg on the Kattegat ; from Trondhjem through Röros *via* the Glommen valley to Oslo and thence on to Goteborg and Malmö ; and from Bergen to Oslo. The Göta Canal joins Goteborg to the Baltic at Norrköping. Malmö, Oslo and Stockholm are connected by air with London.

Commerce of Norway and Sweden

EXPORTS from Norway include wood-pulp and paper, animal produce, minerals and metals, tallow, oils, tar, timber and wooden goods. From Sweden the chief exports are wood-pulp, paper, metal goods, machinery, timber, iron, other minerals, animals and animal foods.

IMPORTS of both countries consist mainly of corn and flour, textiles, coal, other minerals, metal goods and machinery.

The greater part of the trade is with Great Britain, Germany, the United States and Denmark.

Spitzbergen

The archipelago comprising Spitzbergen and other islands, situated 400 miles north of Norway, is included in the Kingdom of Norway. The principal product is coal, of which over 250,000 tons were exported in 1932.

Jan Mayen Island, a bleak, desolate and uninhabited island between Greenland and northern Norway, also belongs to Norway. It is volcanic and mountainous and is occasionally visited by seal hunters, fishermen and whalers.

THE EASTERN BALTIC STATES

Area : 248,923 sq. miles. *Population :* 9,000,000.

The republics of Finland, Estonia, Latvia and Lithuania border the east coast of the Baltic Sea, facing Sweden. They are bounded on the east by Russia. Finland is the most northerly state and is also the largest and most populous. The areas and populations of the republics are :—

		Area	*Population*
Finland	...	149,900 sq. miles	3,670,000
Estonia	...	18,353 sq. miles	1,124,000
Latvia	...	25,000 sq. miles	1,900,000
Lithuania	...	55,670 sq. miles	2,422,000

Relief and Climate

The whole area comprising the Eastern Baltic States is part of the great European plain and in few places rises to more than 600 ft. above sea-level. In the south-east of Finland there are numerous lakes, the largest being Lakes *Ladoga* and *Saima.* In Estonia the most notable lake is *Lake Peipus*. Apart from such great inlets as the *Gulf of Finland* and the *Gulf of Riga*, the coastline in general is low and even, but there are many small islands. There is a general lack of important rivers, the largest streams being the *West Dwina* of Latvia and the *Niemen* of Lithuania.

The climate may be described as continental, for the lands are exposed to the cold winter winds from the north-east and are shut off by Scandinavia from the moderating Westerlies. In consequence, most of the ports are ice-blocked during winter. The rainfall occurs chiefly in summer.

Industries of Finland

Forestry is the most important industry and provides 80 per cent. of the country's exports—raw timber, pulp and paper being the principal products. (See also "Timber", Chapter 13.)

Agriculture is second in importance to forestry. The most fertile region is in the south-west where oats and rye are grown, and potatoes, flax, and hemp are cultivated to some extent. The most important crop, however, is hay, which is used as winter fodder for cattle. The rearing of cattle gives rise to a considerable export of dairy produce, and this would appear to be the most likely basis of prosperity for Finland.

Mining.—Mineral products are negligible; some iron ore is found near the lakes, but the quality is poor.

MANUFACTURES, apart from the timber industry, are relatively unimportant. They are almost entirely confined to metallic goods, made from imported ore with the aid of imported coal, and textiles, which are manufactured to some small extent at Tammerfors.

Industries of Estonia, Latvia and Lithuania

FORESTRY is first in order of importance in Latvia and Lithuania, considerable quantities of timber being exported.

AGRICULTURE is the second industry, flax being grown for export and oats, rye and potatoes for home consumption. Cattle rearing and dairy farming are becoming increasingly important, and in Estonia arable and dairy farming are more important than timber industries.

MINING and MANUFACTURING are not much developed.

Communications and Towns

The railways in the Eastern Baltic States are chiefly of local importance and serve to connect the ports; there are, however, three important Russian lines running through Latvia (*see* Fig. 156). The rivers are of little account, mainly because they are frozen over for many months of the year. The only canals of value are those connecting the lakes in Finland.

Helsingfors (Helsinki), the capital and principal port of Finland, with less than 250,000 inhabitants, lies on the northern shore of the Gulf of Finland (see p. 220). *Riga*, the capital of Latvia, lies on the Gulf of Riga, and is an important railway terminus. Standing at the ocean terminus of an important Russian railway from Smolensk, it acts as the outlet for much Russian produce and does a large trade in timber, flax, meat and dairy produce. *Tallinn* (Reval), on the Gulf of Finland, is the capital and leading port of Estonia. *Vilna* is claimed by the Lithuanians as the capital of Lithuania, but the dispute between that country and Poland is not yet settled, so that politically Vilna is still regarded as being in Poland. *Kovno* is at present the seat of the Lithuanian Government, whilst *Memel* is the chief port of the country.

The ports of Estonia, Latvia and Lithuania provide a means of access to the Russian interior, particularly in winter, when they are open for a longer period than the Russian port of Leningrad. Russia is not yet reconciled to the loss of these small Republics because it leaves her with very limited port accommodation in the Baltic, and as a result the Republics have assumed international importance.

Commerce of the Baltic States

The principal *exports* of these states are timber, wood-pulp, paper, flax, dairy produce, meat and hides; whilst the *imports* consist chiefly of coal, textiles, machinery and other manufactured articles.

The largest share of the trade is with Germany, followed by Great Britain.

DENMARK

Area: 16,576 sq. miles. *Population:* 3,625,000.

Denmark comprises the much indented peninsula of Jutland together with numerous islands in the Baltic Sea. The country is bounded by the North Sea on the west, the Baltic on the east and Germany to the south.

Relief and Climate

The whole of Denmark is low-lying, no part rising to over 600 ft. above sea-level. The country is lowest on the west, where the coast is fringed with sand dunes backed with lagoons. The east is higher and the coast more indented. Throughout the country much of the land is heather-covered or bogland, and the fertility as a whole is not very great.

The climate is similar to that of Scotland, with warm summers and cool to cold winters. The rainfall, which falls mostly in summer, is not very heavy owing to the fact that the Westerlies have an almost unobstructed course over the country, which has no hills to tap their moisture.

Industries

AGRICULTURE.—The land is not naturally productive, but most of the population is engaged in farming and, thanks to the intensive cultivation for which the people of Denmark are famed, such crops as oats, barley, rye, beetroot and potatoes are raised wherever possible. Dairy-farming on scientific lines and under co-operative methods is the most important industry and finds a ready market for its products—butter, cheese and cream—in the neighbouring highly-populated countries, especially Great Britain and Germany. The refuse of the dairy produce is used extensively as food for cattle, pigs and poultry, which are reared in large numbers, and contribute great quantities of meat, bacon and eggs to the national exports.

MINING, FISHING AND MANUFACTURES.—China clay is the only mineral of importance and is used at Copenhagen for the manufacture of its famous porcelain. Fishing is important off the west coast. The manufactures are mainly connected with food products and include the production of butter, cheese and sugar-beet, and brewing.

Communications and Towns

The rivers of Denmark are unimportant, but the flatness of the country and the necessity for bringing dairy produce to market have encouraged the construction of some good canals and roads. Railway construction, too, has been undertaken and over three thousand miles have been built.

Numerous ferries run between Jutland and the islands, many of them transporting the railway rolling stock as it runs with its load of passengers and/or goods.

The only towns of great importance are *Copenhagen*, the capital, situated on the island of Zealand (*see* p. 220); *Esbjerg*, a packet station on the west coast exporting fish and butter; and *Aalborg*, a cattle port on the north coast of Jutland.

Commerce

Denmark's *exports* consist almost entirely of butter, cheese, bacon, eggs and livestock, whilst the principal *imports* are textiles and other manufactured goods, coal and cereals.

Almost 50 per cent. of the total trade is with Great Britain and 20 per cent. with Germany.

Faroe Islands and Iceland

THE FAROE ISLANDS, in the Atlantic between the Shetland Isles and Iceland, are owned by Denmark and are occupied mainly in fishing and sheep-rearing.

ICELAND, a small island, 40,000 square miles in area, is situated in the North Atlantic and almost touches the Arctic Circle. It is a Kingdom united to Denmark by reason of the fact that the King of Denmark is also the King of Iceland, but otherwise the two countries are politically distinct.

The land is mountainous, and there are many volcanoes, including the famous *Mount Hekla*, as well as geysers and hot springs. The climate and vegetation are of the cold desert type except in the south-west lowlands which lie in the " winter gulf of warmth " of the North Atlantic Drift, and which support sheep, cattle and ponies. Elsewhere fishing is the only important occupation, whilst sulphur is mined in the volcanic areas. The capital and port is *Reykjavik*, which exports fish, hides, skins, oils, tallow and wool.

THE NETHERLANDS (HOLLAND)

***Area*: 12,579 sq. miles.** ***Population*: 8,200,000.**

The Kingdom of the Netherlands is situated on the western edge of the European continent, with the North Sea to the north and west, Germany to the east and Belgium to the south.

Relief and Climate

The country is very low-lying, the highest parts being little over 300 ft. above sea-level, whilst much land in the west is below sea-level. In the south and south-west the country consists of the Rhine delta.

The western area is protected against the encroachment of the sea by *dykes*, *i.e.*, artificially constructed embankments of soil, stone and waste material. The coastline is low and smooth with many sand dunes and lagoons, and is fringed with low islands of which the *Frisians* are the most notable. The sea has made one great inlet, the *Zuyder Zee*, which is being gradually reclaimed by dint of endless labour and perseverance, and which has been cut off from the sea by the building of a dyke or dam across its entrance. (See Fig. 127.) Other low-lying areas near the rivers have also been reclaimed.

On the whole the climate of Holland is warm in summer and cool in winter, with no great extremes of temperature. The Westerlies prevail almost constantly, though in winter occasional east winds cause hard frosts. Most of the rainfall occurs in summer, but it is not abundant because of the absence of high land. Humidity, however, is fairly high, because of proximity to the sea and the absence of natural drainage.

Industries

AGRICULTURE is the chief occupation and source of wealth of the Dutch people. The principal crops are oats, rye, wheat and beet, together with a certain amount of barley and flax. The wheat and sugar-beet are grown chiefly round Limburg; the oats and rye mainly in the north. The Haarlem district has a considerable production of bulbs which find a wide market in other countries and especially in the United Kingdom. The reclaimed lands, called "polders," provide excellent pasture and the dairy-farming industry is of great importance, large numbers of cattle and pigs being reared. Dutch butter and cheeses are world-famous and find a ready market in industrial north-west Europe.

MINING.—Minerals are unimportant in Holland except for the Limburg coalfields in the south-east.

THE MANUFACTURING INDUSTRIES have developed mainly to supply the Dutch colonies and to work the large imports of colonial produce. They include tobacco factories; distilleries; breweries; sugar refineries; textile, glass and pottery works; and shipbuilding.

FISHING is carried on to some extent in the North Sea beds, the principal catches being herrings and oysters.

Communications and Towns

The fact that the highly important and navigable *Rhine* has its outlet in Holland is of immense importance to that country, more especially because so much German trade passes along this river to the sea. The *Maas* runs parallel to the Rhine but has to be replaced in parts by more navigable canals.

Holland relies for transport facilities largely upon her canals, of which there is a vast network, many minor canals being used for the local transport of agricultural produce. One of the most important canals runs from the extreme north of Holland, through Amsterdam and thence *via* Haarlem and Leyden to Rotterdam. Another (the "New Waterway") improves Rotterdam's water connection with the sea, while the Mer Wede canal joins Amsterdam through Utrecht to the Rhine.

The railway system of the Netherlands is well developed and is now being electrified. Lines connect Amsterdam, Utrecht and Rotterdam with one another and also with the towns of the north and south.

The chief town is *Amsterdam* (see p. 217), situated to the south of the Zuyder Zee. *Rotterdam* (see p. 218) is the chief port, and *Utrecht* is an important railway junction. *Haarlem*, near the west coast, manufactures linen from local flax and is an important bulb-growing centre. *The Hague*, the capital, has a noted pottery industry and is an historic meeting place for the statesmen of the European powers. *Delft* is noted for pottery.

Commerce of Holland

Holland's principal *exports* are dairy produce (butter, cheese and margarine), textiles and coal. The *imports* consist mainly of iron and steel goods, raw cotton and cotton yarns, cereals and flour, wood, coal, raw tobacco, mineral oil and coffee. A large proportion of the trade is with Great Britain and Germany.

BELGIUM

Area: 11,752 sq. miles. *Population:* 8,200,000.

Belgium is situated in north-west Europe, and is bounded on the north by Holland, on the east by Germany and on the south by France, whilst the North Sea forms its western border.

Relief and Climate

The northern and western parts of Belgium form part of the great European plain and are therefore low-lying, but in the south-east is part of the high plateau of the *Ardennes* which rise in places to over 1,500 ft. (see Fig. 158). The Belgian coastline is low and even, with a wide estuary in the north where the Scheldt, which drains the western plain, enters the s[illegible] The lower slopes of the western part of the highland region are drained by the Meuse.

The climate is of the oceanic type, like that of Holland, but the temperature is less extreme and the rainfall is distributed more evenly throughout the year. In the more elevated parts to the south-east the temperature is naturally somewhat lower than it is elsewhere.

Industries

AGRICULTURE is carried on to a great extent on the plain. In the Flanders district rye, potatoes and flax are grown; around Ghent wheat and sugar-beet are the chief crops; while the Campine district and reclaimed lands near the coast are given over to cattle and dairy-farming. On the south-eastern plateau sheep are reared, and in sheltered valleys, such as that of the Meuse, the vine is cultivated.

MINING is one of the principal occupations of the Belgians and about one-seventh of her industrial workers are engaged in this industry. There are vast coal deposits on the lower northern uplands of the plateau, extending from Liége to Mons and continuing into France (see Fig. 158). The principal centres are Mons, Liége, Namur and Charleroi.

There are also extensive coal deposits in the Campine district in the north, but these are as yet little exploited.

The iron ore found in the south-east and north of Belgium is not mined to any great extent, mainly because of the proximity of the Luxemburg ores.

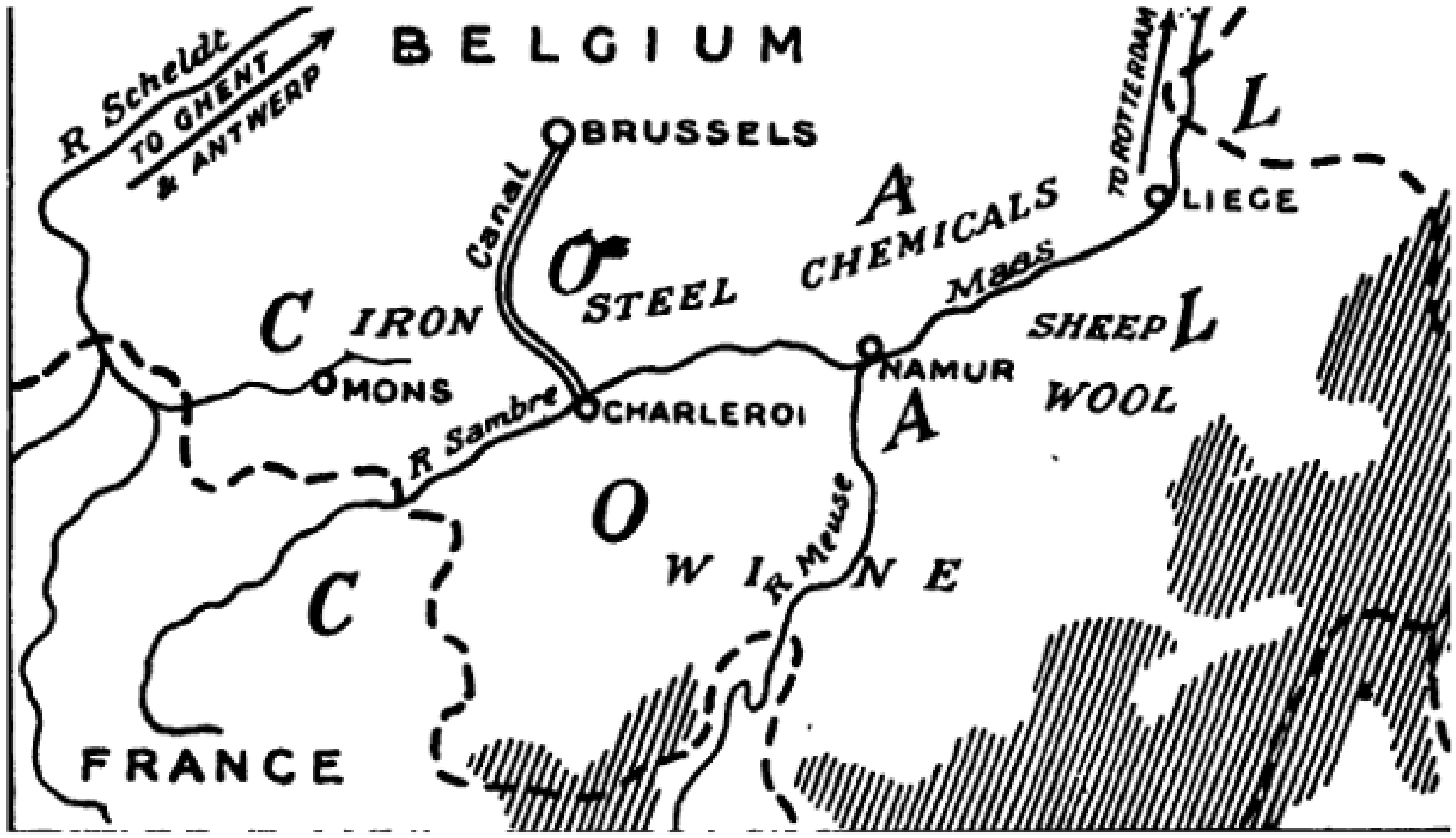


FIG. 158: BELGIUM'S INDUSTRIAL AREA.
(Land over 1,200 ft. shaded).

MANUFACTURES.—Belgium's large coal deposits have naturally given rise to important manufactures for which the country is world famous. Local deposits of iron ore, supplemented by imports from Luxemburg, have led to the development in the coal district of large iron and steel and machinery industries centred at Charleroi, Mons and Liége. Glass also is made at Charleroi; chemicals are manufactured on the coalfield and sulphuric acid near Liége. Textile industries are important. Linen s made at Ghent, Courtrai and Tournai; cotton at Ghent and Nivelles as well as in Hainaut, whilst Bruges has lace, linen, cotton and woollen mills. Minor industries include shipbuilding and the manufacture of jute, hemp and porcelain.

Communications and Towns

In Belgium the construction of railways, canals and roads has been much facilitated by the comparative evenness of the surface. Ghent, Bruges, Lille, Antwerp and Brussels are all linked by rail, and main lines run from Brussels (*a*) *via* Tournai and Lille to Paris ; (*b*) to Germany *via* Liége to Cologne ; (*c*) *via* Namur and the Meuse valley to Nancy ; and (*d*) northwards to Antwerp and Rotterdam.

The important rivers—the *Scheldt*, the *Lys*, the *Sambre* and the *Meuse*—are all navigable, while canals link the Lys and Scheldt with north-eastern France, join the Sambre to the Oise, link up Ghent and Ostend *via* Bruges, and connect Brussels with Charleroi.

Brussels, the capital of Belgium, is an important manufacturing town with a variety of industries. *Antwerp*, at the head of the Scheldt estuary, is the chief port (see p. 217). *Ghent*, situated on the plain at the confluence of the Lys and Scheldt, has linen and cotton factories. *Charleroi*, on the Sambre, has good rail and canal connections and is an important centre for coal-mining and glass-making. *Liége*, on the Meuse, has important industries founded on local coal, zinc and wool. *Namur*, at the junction of the Sambre and the Meuse, is a coal-mining centre. *Ostend*, on the coast opposite Dover, is an important packet station.

Commerce

The principal *exports* of Belgium are mainly manufactured goods—machinery, rolling stock, cement, zinc, glass and chemicals—and coal, but they include also a small amount of foodstuffs (*e.g.*, sugar) and livestock.

The chief *imports* consist of raw materials (such as iron ore, zinc and flax), and foodstuffs and manufactures (such as textiles).

The principal countries concerned in Belgian trade are Great Britain, Germany, France, the Netherlands and the United States.

LUXEMBURG

Area : 999 sq. miles. *Population* : about 300,000.

Luxemburg is a small independent Duchy situated south of Belgium. It is important for its output of iron ore, which is used in the local iron and steel industry and is also exported in large quantities to Belgium, France and Germany. There are no large towns.

FRANCE

Area : 212,659 sq. miles. *Population* : 42,000,000. (1947)

France is bounded on the west by the English Channel and the Atlantic Ocean, on the north by Belgium, to the north-east by Germany and to the south-east by Switzerland and Italy, whilst the Pyrenees separate her from Spain.

Relief

France may be divided physically into two regions—the lowlands and the highlands. The lowlands occupy the western and north-western parts of the country and are dissected here and there by uplands, *e.g.*, Normandy and Brittany. The plains may be sub-divided into three great basins—the *Paris Basin* drained by the *Seine*; the *Aquitaine Basin* drained by the *Garonne*; and the *Rhône-Saône Basin* in the south-east. The upland areas stretch through eastern France from the *Cevennes* in the south to the *Ardennes* in the north. The coastlines of France are on the whole regular and do not afford easy access to the interior, except through the estuaries.

The most important rivers have already been noted (Chapter 21). The *Seine* and its tributaries, converging on Paris, flow northwards to the English Channel through low-lying country and are frequently in flood. The *Loire* and its tributaries flow east from the Central Plateau to the Atlantic and drain Anjou. The *Garonne* drains Guyenne and, bringing plenty of water from the plateau, is usually turbulent. The *Rhône* rises in Switzerland, drains through Lake Geneva, and, after being joined by the *Saône*, flows southwards to the Mediterranean Sea.

Climate

The climate of France is largely influenced by the sea, and may be described generally as temperate in the north-west and sub-tropical in the south-east, although considerable variations occur. The higher parts naturally have the greater precipitation and the less equable climate, whilst, in the south, the Mediterranean region enjoys hot, dry summers and cool, wet winters. Elsewhere the rainfall occurs throughout the year, with perhaps a predominance in summer, and diminishes from west to east, whilst the amount of sunshine increases from west to east.

Industries and Products

AGRICULTURE is a highly important industry, and the varying climatic conditions in different parts of the country give rise to a variety of products. The wheat crop from the Paris, Aquitaine and Loire basins is very large, but is insufficient for home needs. Oats, barley and fruits (apples and pears in the north and Mediterranean fruits in the south) are grown, while maize is cultivated to some extent in the wetter parts, *e.g.*, southern Aquitaine. Other crops include flax, hemp, rye, beet and tobacco, with flowers and early vegetables from Brittany and Normandy. The heavier rainfall of Brittany and Normandy also favours cattle-rearing, yielding cream and butter as important products.

The most famous crop of France is the *vine*, which enjoys widespread cultivation owing to the long, sunny summer. The centres of cultivation are the river valleys, and several of these are famed for the special type of wine which they produce—"champagne" from the Marne valley (Paris basin); "claret" from the Garonne valley (Aquitaine basin); and "burgundy" from the Rhône-Saône basin. The valley of the Charente, with Cognac as its centre, is famous for brandy. The Rhône valley, in addition to its vineyards, is important also for the cultivation of the mulberry, upon which plant silk worms are reared to provide large quantities of natural silk.

FISHING.—The indented coastline of Brittany has a seasonal fishing industry, the main catches being of pilchards and sardines, whilst the Mediterranean coast also has valuable fisheries, especially of *tunny*—an important fish food of the Mediterranean coastal districts.

MINING.—In various parts of France there are mining industries based on local supplies of coal and iron. Coal is mined in the north-eastern districts around Pas de Calais centred at Anzin. This coalfield, which is a continuation of the Belgian field, produces about 90 per cent. of the total French output of coal, but the product is not of good quality as much of it is powdered. Coal is mined also in the Central Plateau, especially near St. Etienne. The rich Saar coalfield, which once belonged to Germany, is under the control of France until 1935, but even so the French still find it necessary to import further supplies to feed their manifold industries. Iron is mined around Le Creuzot and St. Etienne, but the main iron ore deposits of France are in the rich Lorraine iron-field, with Nancy as its centre. Alsace has important potash deposits round Mulhouse.

MANUFACTURES.—Wine-making is an important industry in the vine-growing districts and wines constitute the principal export of France. Steel manufacture is important on the coalfield at such towns as Lille and Valenciennes; in Lorraine; at Caen; at St. Etienne, which has important ironworks based on the local supplies of coal and iron; and at Le Creuzot, which is the Government arsenal. Cotton manufacture is extensive (*a*) on the northern coalfield, especially at Lille, Nancy and Amiens; (*b*) at Rouen; and (*c*) at Mulhouse in Alsace. Lyons is noted for both silk and machinery. Woollens are made at Amiens, Reims and Roubaix; linen at Lille and Cambrai; and lace at Bayeux, Valenciennes, Lille and Bailleul. Marseilles has a great variety of industries, especially the manufacture of soap, chemicals, candles and similar products which utilise the vegetable oils imported from West Africa and the East. Motor-car manufacture is important at Paris, Lyons and St. Etienne.

Natural Regions of France

The natural regions of France, which are fairly well defined, include (1) the Paris Basin in the north; (2) Brittany and western Normandy in the north-west; (3) North-East France; (4) the French Alpine Region in the south-east; (5) the Central Plateau; (6) the Rhône Valley, between the plateau and the Alps, together with the Mediterranean coast in the south-east; (7) the Aquitaine Basin in the south-west, and (8) the Pyrenees separating France from Spain.

THE PARIS BASIN corresponds broadly with northern France. It is a low-lying region sub-divided by the river basins, of which the most important is that of the Seine. Although the whole region is subject to oceanic influences, continental traits are apparent, and greater extremes of temperature are experienced than is the case in other marginal regions, especially in the east. The west is the wetter part and here cattle and sheep rearing is important. The basin is a rich agricultural district, producing large quantities of wheat, barley, oats and sugar-beet, whilst in Champagne in the east, the dry, chalky hills are eminently suited to the cultivation of the vine. from which champagne is made. *Reims* is the centre of the champagne industry.

In the north lies the most important coalfield of France and its attendant industries, which make the region the most important industrial area of the country.

Paris, the capital, has numerous small industries, and is world famed for its luxury goods (*articles de Paris*) and as a women's fashion centre. It is also a highly important railway and road centre, as well as the leading air port of the continent. (See also Chapter 16.)

Rouen, situated above Le Havre on the Seine, is an important port, but is prominent mainly as a textile centre. As the centre of the French cotton trade it has been called the "Manchester of France," though, unlike Manchester, it makes also silks, woollens and linens, while it has important iron and steel industries based on coal and iron found nearby. Rouen is important, also, for shipbuilding, and as a railway and canal junction.

Le Havre is the commercial port and outlet for Paris, while *Dieppe*, *Boulogne* and *Calais* are cross-channel ports having an important passenger traffic with Britain.

BRITTANY AND WESTERN NORMANDY are frequently referred to as the *Armorican Massif*, which comprises a peninsular, low plateau region of ancient rocks. Thanks to oceanic influences, the climate is equable but moist. Much of the soil is infertile, particularly on the heights, and the climate favours the rearing of sheep and cattle, rather than agricultural pursuits.

Rye and barley are grown in the north and some wheat in the south, whilst the lower Loire valley produces white wines. Market-gardening, including fruit cultivation (especially of apples for the production of cider), is a feature of the fertile lowland and there is much fishing round the coast.

The leading manufactures are woollens at *Rennes* and *Leval*, and cottons at Rennes. Other towns of this region are *Nantes* (the port of the Loire basin), not very important because its hinterland is poor, though some leather manufacturing is carried on ; *Brest*, a naval port ; and *Cherbourg*, an important calling place for transatlantic steamers.

NORTH-EAST FRANCE lies between the Paris Basin and the eastern boundary of France, and includes the Vosges, the upper Meuse valley, Alsace, Lorraine and the Saar. Its eastern situation away from the ocean gives it a climate approaching the continental type. The Vosges are forested and support timber industries.

Lorraine contains great deposits of iron ore and embraces the fertile Moselle valley, which produces wine. It imports considerable quantities of coke (mainly from Germany), and has the most important pig iron manufacturing industry in Europe, with a large export trade to northern France, Belgium, Germany and Luxemburg. There is also a textile industry, centred in *Nancy* and *Epinal*.

The coal of the Saar Basin has been of great benefit to France. It is not suitable for iron smelting but supports glass, chemical and pottery industries. *Strasbourg* is an important river port on the banks of the Rhine, while in the Moselle valley lie the fortress towns of *Metz* and *Nancy*.

Alsace is a rich, densely populated lowland area producing agricultural products and it has the most important cotton industry in France, centred on *Mulhouse* and *Colmar*. Large deposits of potash also are present and the water power of the highlands is utilised for the manufacture of fertilisers.

THE ALPINE REGION is a typical highland region with a sparse population engaged mainly in pastoral pursuits. The development of water power, however, has led to some industrialisation, notably the production of aluminium. *Grenoble* has a glove industry. A feature of this region is the great transverse valleys which facilitate communication with Italy and other countries.

THE CENTRAL PLATEAU includes the Cevennes and the Auvergnes. This region has already been described in Chapter 21, p. 342.

THE RHÔNE VALLEY AND THE FRENCH MEDITERRANEAN COAST is a rich area with a typical Mediterranean climate except in the valley of the Saône, where the climate becomes more continental. The southerly aspect of the valley assists in making this region an important wine producing area, burgundy being the chief vintage, whilst the coastal land to the west of the Rhône delta produces vines and the olive. The hills form suitable pasture land and the silk industry, based originally on local raw material as a result of mulberry culture, is very important, the chief centre being Lyons. Wheat and maize also are cultivated.

To the east of the Rhône delta lies the "Riviera," a famous winter resort, with Cannes and Nice as the chief centres. The Rhône valley forms a "corridor" which is of great importance as a means of communication between northern France and the Mediterranean, whilst important branch lines lead to the countries east of the Alps.

Marseilles, the great French Mediterranean port, lies in this region to the east of the Rhône delta (see p. 215 and Fig. 159). It is the outlet for much of France's exports and the inlet for a vast range of products from the East and elsewhere. *Lyons*, chiefly famous for silk and machinery, stands at the head of navigation of the Rhône, and controls the route (the "Rhône corridor") from the Mediterranean to northern France. *Dijon* is important as a route centre.

THE AQUITAINE BASIN is a flat, low-lying region drained by the Garonne in the centre, the Charente in the north and the Adour in the south. Its latitude gives it hot summers whilst proximity to the ocean causes a plentiful rainfall. The soil is, on the whole, rich and agricultural pursuits predominate, with the production of wine as the outstanding industry.

The great wine area is in the lower valley of the Garonne where the well-known claret is made, the industry being centred at *Bordeaux*, which, standing at the head of the Garonne estuary, is an important route centre and a prominent wine port, while it has also chemical and sugar-refining industries dependent chiefly on imported raw materials.

In the west of the region south of Bordeaux is an area known as the "Landes," a region of shifting sands and gravels which formerly encroached on the fertile areas but which has now been rendered harmless and productive by the plantation of large numbers of pines.

The only other important town of the Aquitâine Basin is *Toulouse*, an inland route centre with railway connections to Bordeaux, Marseilles and Spain, river connection with Bordeaux by the Garonne and canal connection by means of the Canal du Midi to the Mediterranean Sea.

THE PYRENEES, the barrier between Spain and France which forces the routes to keep to the narrow coastal plains, are important mainly for their water power, which is attracting metallurgical industries. The climate of the region is influenced principally by its altitude and by the Atlantic Ocean, the west being the wetter part. The higher pastures support sheep and cattle in the summer months, while the lower slopes are covered with forests. The valleys support agricultural communities, wheat, maize and barley being the chief crops.

Carcassonne, in the Aude valley, is a gap town on the route between south-western France and the Mediterranean Sea.

Communications

The rivers and canals of France are very important as a means of communication, and the network of canals joining the rivers is in constant use for the local transport of produce as well as for the transport of goods from the interior to the principal ports (see pp. 286–7 and 346).

The railways of France have considerable international as well as local importance, lines radiating from Paris to almost every part of Europe. The principal lines are given in Chapter 18 and may be followed, with other lines, from Fig. 156. The routes of southern France are shown in Fig. 159. From Paris, air routes connect with all parts of Europe and regular lines serve also North and West Africa.

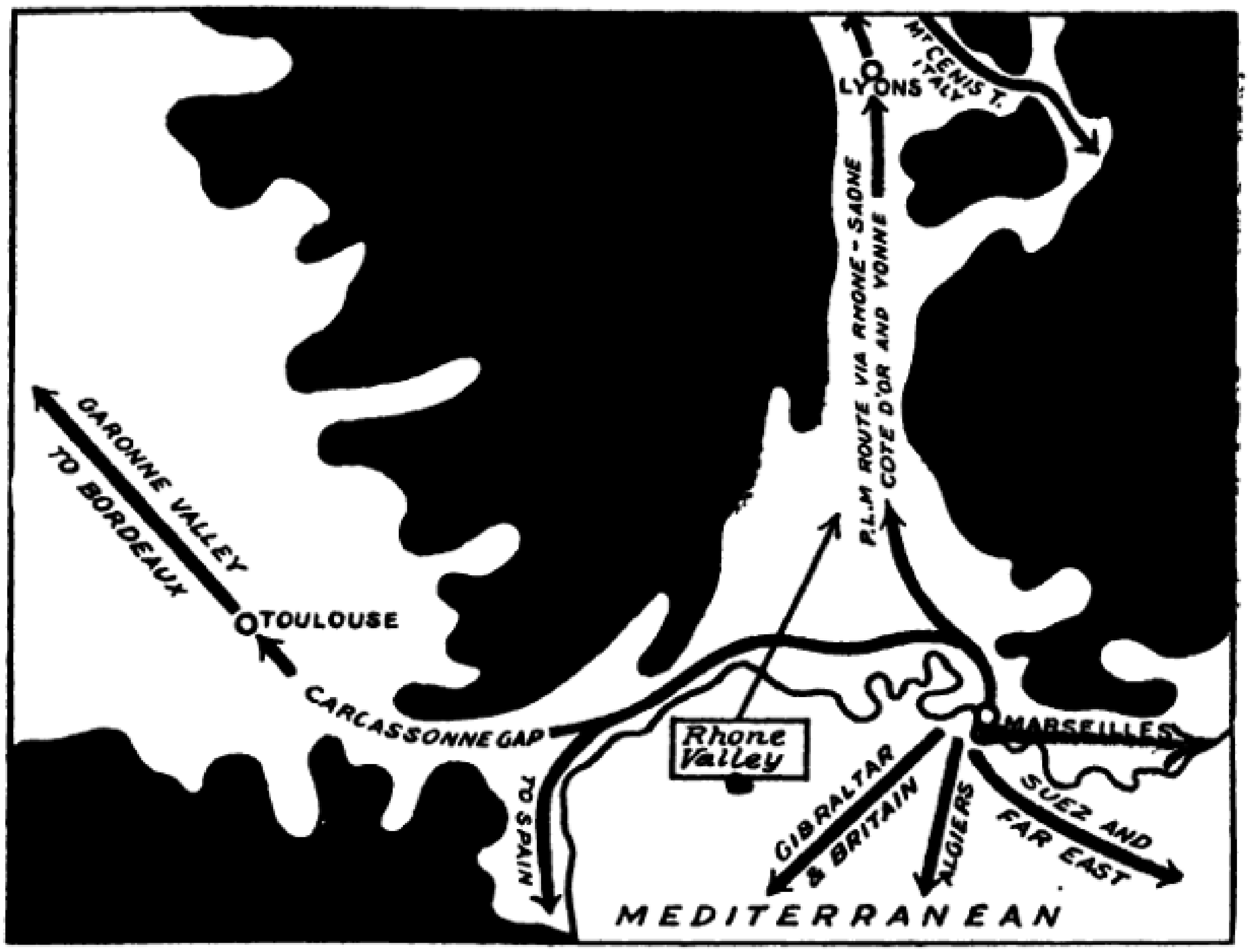


FIG. 159: ROUTES OF SOUTHERN FRANCE.

(N.B.—An arrow should be shown pointing from Marseilles eastward along the coast, to indicate the coastal route to the Riviera and Italy.)

Commerce of France

The principal *exports* of France are silk and cotton goods, chemical products, iron and steel goods, automobiles and wine.

The principal *imports* consist of wine, coal and coke, wool, raw cotton, cereals, petroleum and oil-seeds.

Trade is carried on mainly with Great Britain, Belgium, Germany, the United States, Switzerland, Italy and Argentina, and it is noticeable that, as in most agricultural countries, the largest towns of France are seaports.

GERMANY

Area: 181,000 sq. miles. *Population:* 66,000,000. (365)

The German Republic is bounded by the North Sea, Denmark, the Baltic Sea, Belgium and the Netherlands on the north; by France, Switzerland and Austria on the south-west and south; and by Czechoslovakia and Poland on the south-east and east.

Relief and Climate

Northern Germany forms part of the undulating Great European Plain, in the north of which are the low *Baltic Heights* bordering the Baltic Sea. In the south, extending from the southern boundary to the Danube, lies the Alpine foreland. Between these divisions lie the Central Uplands, including, in the west, the *Rhine rift valley* (between the *Vosges* and the *Black Forest*), the *Taunus* and the *Eifel Mountains* ; in the south, the *Swabian* and *Franconian Jura* ; in the east, the *Bohemian Massif* (including the *Erz Gebirge, Riesen Gebirge* and the *Sudetes*) ; and, in the north, a number of uplands of which the most important are the *Harz Mountains*.

The coastline of North Germany is broken by deep river estuaries, *e.g.*, the *Ems*, *Weser*, *Elbe* and *Oder*. It is noticeable that all the rivers drain to the north or north-west and that the *Rhine* (see Fig. 160), the great German national river, reaches the sea through Holland, a fact which is a great disadvantage to Germany but which is, as we have observed, of immense importance to the Netherlands.

Western Germany has a mild, moist climate as it is subject to the influence of the Westerlies. As the distance from the coast increases, however, greater extremes of temperature and less rainfall are experienced, while the rain falls chiefly in summer. These conditions are modified locally by relief, and the valleys of the Rhine and the Moselle, sheltered by mountains, have a warm climate with just sufficient rainfall. In the south, the effect of lower latitude is counteracted by greater altitude.

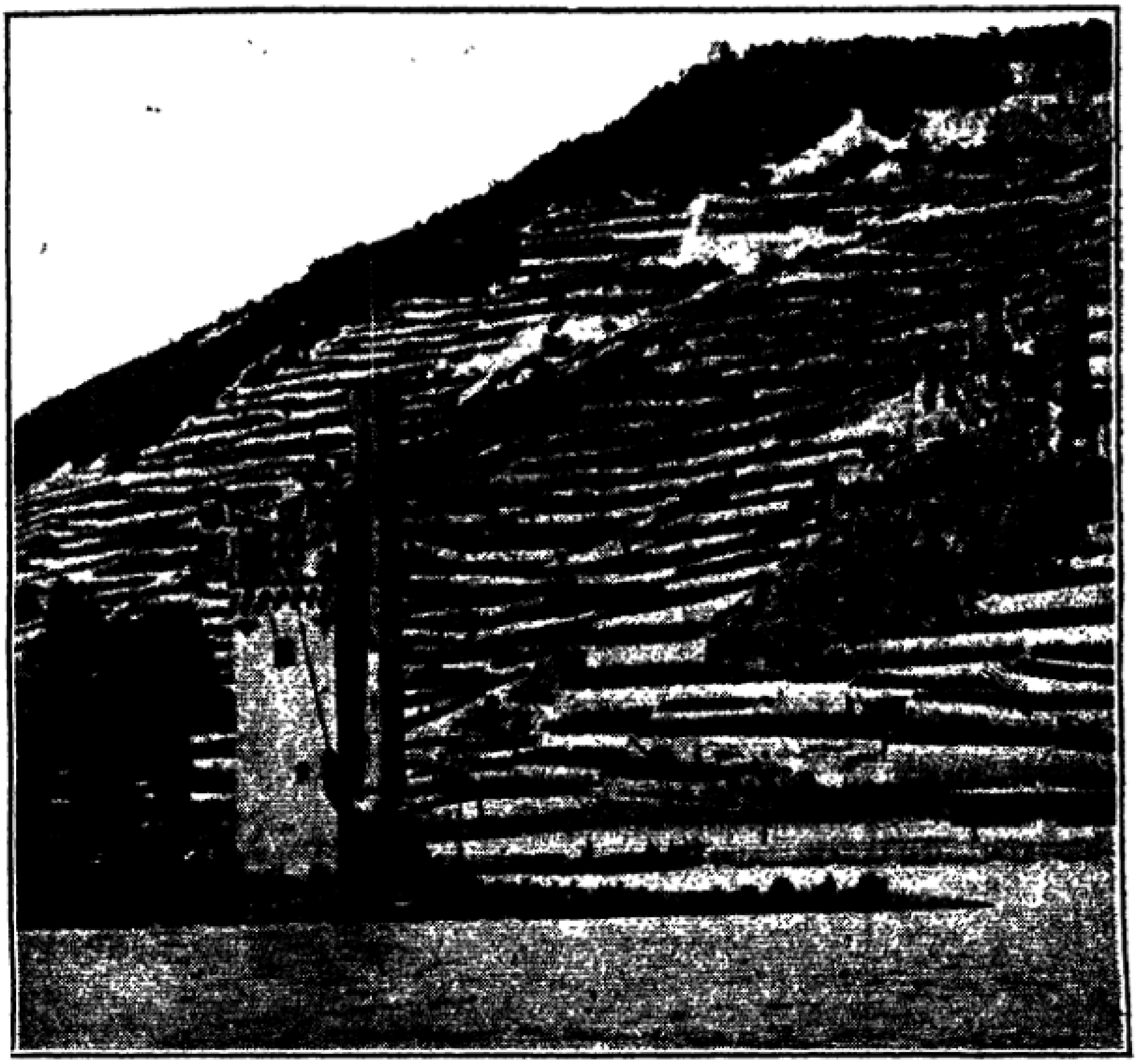
Industries

Forestry is an important industry on the plain and on the uplands. Much of the original forest land has been cleared, but production is now carefully supervised by the Government, which is fully alive to the importance of preventing the undue exploitation of the nation's timber resources. The Scotch pine is the principal tree except along the Baltic coast, where beech, birch and oak predominate. Paper is made at Stettin, Düren and Breslau ; toys at Nuremburg and Sonneburg, while Leipzig is a famous printing and bookmaking centre.

Agriculture is of great importance on the plain. The soil is not naturally fertile, particularly in the north, but by intensive methods of cultivation, rye, oats and potatoes are grown in the north of the plain, over wide areas and in large quantities. Hay crops also are important. Sugar-beet is widely distributed, but the main areas are in Silesia and near Magdeburg, which has large sugar refineries. Germany is one of the world's largest producers of beet sugar. The vine is cultivated in the valleys of the Rhine, Neckar, Main and Moselle. In most parts of Germany cattle and pigs are reared, many of them being fed with the refuse left over after the extraction of sugar from beets and of spirit from potatoes.

Wheat and barley are grown mainly in the south, whilst minor agricultural products are hops, flax, and hemp.

Fishing, localised in the North Sea and Baltic Sea, is an important industry in a number of North German ports.



[*Photo by W. F. Taylor.*

VINEYARDS CLOTHE THE CLOSELY TERRACED HILL SLOPES OF THE UPPER RHINE VALLEY.

Mining.—The principal mineral product is coal, Germany ranking third in the world production. The chief coal areas are the Rhenish-Westphalian region (including the Ruhr, the great industrial region of Germany), Saxony and Silesia. Lignite is an important product of Saxony and, to a less extent, of the Bonn Rhine region, Bavaria and Silesia. Its use has been greatly extended since the War, when Germany was deprived of some of her coal-producing areas. The loss of the Lorraine ironfields also was a serious blow to Germany, more especially because even before the War she found it necessary to supplement home supplies of iron ore by imports. The most important local deposits are now obtained from the valley of the Sieg, a tributary of the Rhine, near

Brunswick. Less important supplies are available in the Harz Mountains and in German Silesia.

At present Germany imports the greater part (about 60 per cent.) of her iron ore from Luxemburg, Sweden and Spain. Zinc is found near the Belgian border and in Silesia, although the greater part of the Silesian deposits have been transferred to Poland. Copper is obtained from the Harz Mountains near Mansfield and in Saxony, silver from Saxony and Silesia and lead from Saxony, Silesia and Hanover. The chief salt deposits are near Schonebeck and Magdeburg, whilst the potash salts near Stassfurt have given rise to one of the most important chemical industries in the world.

MANUFACTURES of iron and steel are highly developed throughout Germany, as has already been indicated in Chapter 14. The chief centres are in the famous Ruhr region at Dusseldorf, Essen, Ruhrort, Duisburg and Dortmund. Solingen and Tuttlingen are noted for steel, while engineering is important at Berlin. The electrical industries are greatly developed in the Ruhr industrial area and at Frankfurt and Nuremburg. Machinery is made at Chemnitz and other centres. Shipbuilding and ship repairing are conducted at the northern ports, such as Hamburg and Stettin, while chemical industries are very important in the Rhine Basin, at Stassfurt, and other places. (See Chapter 14.)

Germany has a large and important textile industry. The chief cotton centres are at Chemnitz and Zwickau in Saxony, but the industry is prominent also in Silesia, in the Rhineland near the Ruhr, and as far south as the Swiss frontier. The woollen industry is more widely scattered and not so extensive, the chief centres being at Aachen and Breslau, and in Silesia. Crefeld is noted for its silk industry, whilst Silesia also produces linen.

Natural Regions of Germany

Germany can be divided easily into two broad divisions based on relief, *viz.*, the northern plain and the southern highlands. A sub-division of these regions therefore gives a division of the country into natural regions. The lowlands may be divided into (1) the Rhine Basin, (2) the Elbe and Weser Basins and (3) the Oder Basin; and southern Germany into (1) the South-Western Plateau and (2) the Sudetes and Silesia, although much of Silesia lies in the Oder basin. East Prussia is an additional region isolated from Germany proper by the Danzig Free Zone and Poland.

THE RHINE BASIN.—The upper Rhine, from its source to Basel, lies in Switzerland, whilst the delta of the Rhine lies in Holland. The whole of the remaining course of the river lies in Germany, and it may be divided into (1) the Rift Valley, (2) the Rhine Gorge and (3) the Lower Rhine. These three regions extend the full length of western Germany.

The Rhine Rift Valley, lying between the Vosges and the Black Forest, begins at Basel and reaches about as far as Bingen, about 20 miles past Mainz, the river acting for many miles as the boundary between France and Germany. The soil is alluvial and extremely fertile, while the climate is favourable to agriculture, as the region is sheltered by highland from the cold winds of the north and east. Agriculture is therefore the predominant industry; grain, potatoes, beet, hops, tobacco and vines are grown, the latter particularly in the Neckar valley.

These products give rise to the manufacture of sugar, beer, wines and tobacco. The highlands are well forested and timber is an important export, the water-power of the hills being used in the saw mills. The wood is also used for the manufacture of artificial silk (from cellulose) in the towns on the Swiss border, and for the making of wooden toys in the Black Forest region.

The principal towns are *Karlsruhe*, which is a health resort (mineral springs) and has miscellaneous industries; *Mannheim*, an important river port; *Stuttgart* (in the Neckar valley), with important chemical works, breweries, motor car works (Daimler) and musical instrument works (Hohler); *Mainz* or *Mayence*, a fortress town at the junction of the Main and Rhine; *Ludwigshafen*, a centre of the chemical industry; and *Heidelberg*, a famous university city.

The Rhine Gorge lies between Bingen and Bonn. Here the river valley narrows considerably, but is very fertile and well cultivated. The vine is widely grown both in this district and in the valley of the Moselle, a left bank tributary which joins the main stream at *Coblenz*, a fortress town. The Taunus and Hunsrück Mountains are well-wooded, but the Eiffel and Westerwald Mountains further north consist mainly of moorland.

Bonn is a famous university town.

The Lower Rhine stretches from Bonn to the German frontier. It consists of a low wide plain with a temperate climate despite the fact that it is open to cold winds from the north and north-east. The soil, in common with the plain as a whole, is not very fertile, but with the aid of fertilisers is made to produce crops of rye, oats and potatoes.

The principal importance of the region, however, is industrial, the coalfields of the Ruhr valley and of Aachen giving rise to large manufactures of all descriptions, the chief being iron and steel, at *Düsseldorf*, *Essen*, *Ruhrort*, *Duisburg* and *Dortmund*; textiles, at *Elberfeld-Barmen*, *Crefeld* and *Aachen*; and chemicals at *Bonn*, *Cologne* and *Elberfeld-Barmen*. *Cologne*, on the Rhine, is an important river port and commercial centre, making, in addition to chemicals, general goods and luxury articles of various kinds.

Other minerals found in this region include iron in the Ruhr valley and near *Aachen* and zinc near *Dortmund* and *Coblenz*.

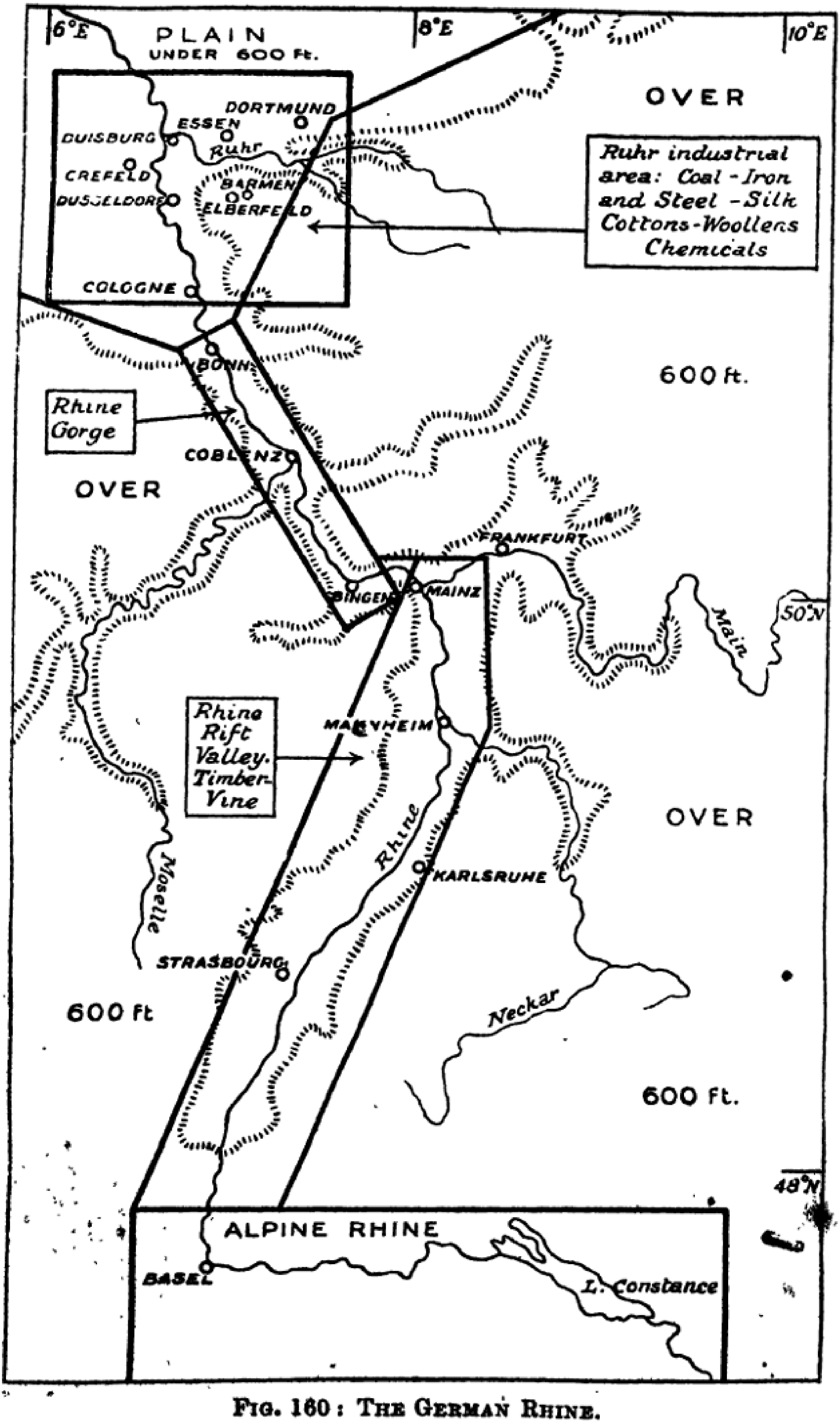


FIG. 160: THE GERMAN RHINE.

It remains to be added that the Rhine is not only itself a great commercial highway, but that its valley is followed by several roads and railways.

THE ELBE BASIN (INCLUDING THE WESER).—The Elbe, which drains Central Germany, enters the country through a gap between the Erz Gebirge and the Sudetes. The Weser rises in the Southern Uplands and flows north to the North Sea. The climate of the region is transitional between the western marginal and the continental types. The area is predominantly agricultural, although in the south, in Saxony, there are important manufacturing districts based on local supplies of coal.

In the north, on the plain, oats, rye and barley are grown, while further south, round Magdeburg, important crops of sugar beet are obtained. Horses and pigs are reared in large numbers. Of minerals, salt and potash are the most important, giving rise to large chemical industries at *Stassfurt* and at *Berlin*. The latter town is, of course, highly important as the political and administrative capital of Germany, and as a prominent route centre. It has also large textile, electrical and engineering works. (See also Chapter 16.)

Saxony, in the south, produces wheat, sugar-beet, hops and barley, but it is mainly important as an industrial region, having large local supplies of brown (lignite) and bituminous coal and easy access to iron ore deposits in Bohemia. Other minerals found in small quantities include copper, silver and zinc, whilst water power is becoming important.

Textile industries are located at *Chemnitz*, *Zwickau* and *Leipzig*; porcelain and china making (based on local coal and china clay) at *Meissen*; machinery at *Dresden*, situated where the Elbe opens on to the plain; and iron and steel at *Zwickau*. *Leipzig*, in addition to its textile and leather industries, has huge paper and printing works, and is an important route junction. It is noted also for its great annual fair, which is visited by buyers and sellers from all parts of Europe—indeed, of the world.

Hamburg (see page 216) and *Bremen* (at the mouth of the Weser) are the great ports of this region. The former is the chief port of Germany, and has important shipbuilding yards as well as numerous industries. Bremen, the second port of the country, also has a large shipbuilding industry, but it is especially important for its vast imports of raw cotton. *Hanover*, on a tributary of the Weser, is a textile and sugar-refining centre.

THE ODER BASIN comprises Eastern Germany, an area with a continental climate and a poor soil. Rye is the predominant crop, followed by potatoes and sugar-beet. Pigs and horses are reared in considerable numbers throughout the region. Except in Silesia, the mineral wealth is inconsiderable and the manufactures are of local importance only.

Stettin, at the mouth of the Oder, has shipbuilding yards and sugar refineries. *Lubeck* is a port trading chiefly with Baltic countries.

SILESIA is an important industrial region, having considerable coal deposits round Königshütte and water power from the mountain streams. These, with a fertile loess soil, have given rise to a dense population. The climate of the region is continental. Wheat, sugar-beet, rye and oats are widely grown and cattle are extensively raised.

Following the Great War only a small portion of the Silesian coalfield has been left to Germany, the greater part having been transferred to Poland and Czechoslovakia. Some iron is found in the Sudetes, while lead and zinc are also located in this vicinity.

The manufactures include textiles at *Breslau* (woollens) and *Hirschberg* (linen); metallic goods at *Beuthen*, *Gleiwitz* and *Breslau;* beer at *Breslau;* chemicals at *Gleiwitz*, and paper at *Ratibor*.

EAST PRUSSIA, lying to the east of the Danzig Free Zone, is unimportant. It has a continental type of climate and the chief products are amber (along the coasts), hops, rye, flax, potatoes, timber and horses.

Konigsberg, the chief town, is a leading Baltic port.

THE SOUTH-WESTERN PLATEAU, with its continental climate and limited agricultural lands, has already been referred to in Chapter 21. Timber is an important product, giving rise to furniture and toy-making industries, using water power, while hops are widely grown for use in the local brewing industry.

Nuremburg or *Nürnberg*, on the Pegnitz in the Franconian Jura, is the principal toy-making and hop collecting centre, and is also a prominent railway junction. *Munich*, in Bavaria, with small local supplies of lignite, has a large brewing industry, and is an important route town, being the focus of the route over the Alps to Italy *via* the Inn, the Brenner Pass and the Adige. It is also noted for its numerous museums.

Frankfurt-on-the-Main, at the place where the river leaves the plateau, is, like Nürnberg, an important railway and industrial centre. It is also the second financial centre of Germany.

Communciations

RIVERS AND CANALS.—The rivers of Germany are much used for navigation. The *Rhine*, to which we have already referred (see p. 346 and Fig. 160) is the most important river of Europe. The *Elbe* (see p. 347), also, is important, while the *Oder* is much used for transporting foodstuffs on the north-east plain, and is navigable as far as Breslau.

Throughout Germany there are numerous canals, especially on the plain where construction was facilitated by the evenness of the land surface. The canals are used not only as means of local communication, but also to join rivers and to assist in the navigation of rivers. Berlin is joined both to the Elbe and to the Oder. The *Kiel Canal*, built by Germany between the North Sea and the Baltic mainly for naval purposes, is now of increasing commercial importance as it provides a sheltered waterway which is used by about 50,000 commercial vessels a year.

The *Ems-Dortmund Canal* joins the manufacturing Ruhr area with the sea, and permits trade from this area to avoid the use of the Rhine through Holland. The Rhine and the Danube are joined *via* Nuremburg, but at present only small vessels can use the canal and proposals have been made for its improvement (see Fig. 149 in Chapter 19).

RAILWAYS.—Railway construction also was facilitated by the level surface of the North German plain, which is used by a number of important lines, from which routes run to the south along the river valleys. Berlin is the chief railway junction and is a centre from which lines radiate in all directions (see Fig. 125 in Chapter 16). The principal routes can be observed from Fig. 156. The Orient Express (see Chapter 18 and Fig. 142) passes through Ulm and Munich in south Germany on its way from Paris to Constantinople.

Commerce of Germany

Germany's principal *exports* are iron and steel, chemical products, coal, dyes, textiles, copper and paper. The principal *imports* are cotton, wool, petroleum, coffee, fruit, copper, butter, wheat and timber.

Trade is carried on mainly with Great Britain, Italy, France, Belgium, Czechoslovakia, Sweden and the United States. The trade with the Netherlands also reaches a large figure but much of this consists of goods in transit between Germany and overseas countries.

QUESTIONS ON CHAPTER 22

1. Give a list of the chief industries of France or Belgium, and state the principal centres where each is carried on. (*C.I.I. Associateship, Accident Branch*, 1928)
2. Describe the country of Belgium, with special reference to its physical character and commercial importance. (*I.S.A. Prelim., Dec.*, 1930)
3. Give a brief account of the geography of France by dividing it into natural regions and stating for each of these regions the principal facts of climate, structure and industries. (*C.I.S. Prelim., Dec.*, 1930)
4. State precisely the distribution of the mining districts of France. In regard to each district give the names of the chief towns, and mention the most important industrial products. (*I.S.A. Prelim., Dec.*, 1929)

5. Give a geographical account of the main occupations of Holland. (*I. of B., Qual.*, 1930)
6. Describe, geographically, a journey from Le Havre to Paris up the River Seine. (*I. of B., Qual.*, 1929)
7. Account, geographically, for the growing importance of the Scandinavian countries to Great Britain. (*I. of B., Qual.*, 1929)
8. Locate the chief manufacturing regions of France. What geographical conditions have favoured their development? (*L.M., Jan.*, 1931)
9. What contrasts of climate (especially seasonal temperature and rainfall) are to be found within the boundaries of France? How do they influence the kind of farming practised in different parts of the country? (*L.M., Jan.*, 1930)
10. Describe three contrasting regions occurring in France, stating and explaining the characteristics of each. (*L.M., Jan.*, 1923)
11. North-East France is distinctly more densely populated than South-West France. Set out in orderly fashion facts to account for this disparity of population. (*L.M., June*, 1926)
12. Describe the relief, climate and natural resources of the Scandinavian Peninsula in such a way as to bring out the contrasts between Norway and Sweden. (*C.S.C.*, 1927)
13. Draw a rough sketch plan of the basin of the Rhine, giving the more important tributaries with their names and the principal towns on the banks or in the vicinity. (*C.I.I. Associateship, Accident Branch*, 1928)
14. What do you consider to be the most important industrial area in Europe (excluding Great Britain and Ireland)? Give an explanatory account of at least *two* industries within it. (*I. of B., Qual.*, 1928)
15. Compare the occupations of the Norwegians and the Danes, and show how geographical conditions have helped to determine the occupations of both these peoples. (*C.I.I. Prelim.*, 1934)

CHAPTER 23

CENTRAL, EASTERN AND SOUTHERN EUROPE

POLAND

Area : 149,274 sq. miles. *Population* : 33,000,000. (220)

Poland is bounded by Germany on the west, Russia on the east, Czechoslovakia and Rumania on the south, East Prussia and Lithuania on the north. There is a small strip of coastline on the Baltic, and the Poles have access to the free city of Danzig, which, by reason of its position near the mouth of Poland's principal river, the Vistula, is the natural outlet of the country though it is now losing much of its trade to the new Polish port of Gdynia, lying to the west.

Relief and Climate

In the north is the *Northern Plain* which forms part of the European Plain and is therefore low and undulating, but in the south is the higher *Central Plateau* and the northern edge of the *Carpathian Region*. There are vast stretches of marsh land, notably the *Pripet Marshes* in the east and the *Posen Marshes* in the west. The main drainage is centred on the *Vistula*, but this and all the other Polish rivers are frozen in winter. The climate is typically continental, *i.e.*, with cold winters, hot summers and summer rainfall. The average annual rainfall increases towards the south.

Industries of Poland

The main occupations of Poland are *agriculture* and *forestry*, which give employment to 65 per cent. of the population. Climatic conditions make rye the leading cereal, but oats, barley, wheat and sugar-beet also are cultivated. There is a large production of potatoes, while flax and hemp are grown.

Warsaw has industries dependent on the forests and on agriculture, *e.g.*, flour milling and flax manufacture. Cotton and woollen goods are manufactured at Lodz. Southern Poland includes part of the rich Silesian *coal* and *iron* field which was formerly held by Germany. Here numerous mining towns depend on these minerals, while to the east of Cracow (the industrial centre of this area) salt and petroleum also are found. Coal is by far the leading mineral, and Poland has built up a large coal-export trade in the Baltic to the detriment of Britain.

Natural Regions of Poland

The broad natural regions of Poland correspond to the physical divisions already mentioned, *viz.*, (1) the Northern Plain; and (2) the Central Plateau and the Carpathian Region.

THE NORTHERN PLAIN is mainly an agricultural area with much alluvial soil deposited in times of flood. Rye, oats, potatoes, flax, and sugar-beet are the chief crops, though small quantities of hops and tobacco also are produced. Cattle, pig, poultry and horse rearing is important and gives rise to exports of meat, eggs, bacon, butter and live animals.

Warsaw, the capital, situated on the Vistula in central Poland, is a prominent route centre from which numerous railways and roads radiate across the plain. It is the centre of an important industrial region. Textiles are the chief manufactures, cotton, woollen and linen goods being produced both here and at *Lodz*, whilst Warsaw has also brewing, timber and flour milling industries. *Posen* is an important railway centre situated in the beet-sugar producing region.

THE PLATEAU AND CARPATHIAN REGION is forested and, except in the south-west, lumbering is the chief occupation. Quantities of timber are exported, whilst the existence of potassium salts in the forest areas has led to the development of artificial silk, paper and chemical industries.

In the south-west is the Polish section of the Silesian coalfield, the centre of which is *Cracow*, near the source of the Vistula. The region also has deposits of iron, lead, salt and zinc, while to the east are considerable deposits of petroleum. Though coal is produced in large enough quantities to provide an export, iron ore is found only in small quantities and has to be imported to feed the large iron and steel works at *Cracow* and *Tarnow*.

Lemberg (Lwow), in the south-east, is a route centre and a university town.

Communications and Commerce

The Vistula, cutting right through Poland, is the chief means of communication. It is navigable to Cracow at the foot of the Carpathians, and is much used (see p. 347) as an outlet for the products of Poland.

Warsaw, Posen and Cracow are the three railway centres of Poland but they are not connected with one another directly because, before the War, these three towns were in Russian, German and Austrian territory, respectively. Warsaw, therefore, is connected with Danzig and Moscow, Posen with Berlin and Cracow with Breslau and Vienna, and the position generally is a striking illustration of the detrimental effect of political considerations on railway communications.

Coal, coke and timber account for one-third in value of Poland's total exports. Other exports include metals, meat, textiles, rye, petroleum, chemicals and eggs. The principal *imports* consist of chemicals, cotton, wool, metals and metal goods, machinery, textile yarns and fabrics, hides and leather.

Trade is carried on mainly with Germany, Great Britain and Czechoslovakia.

EUROPEAN RUSSIA

Area : over 2,000,000 sq. miles. *Population :* over 120,000,000 16)

Russia-in-Europe and Russia-in-Asia are banded together politically as the *Union of Socialist Soviet Republics* (U.S.S.R.), a vast political entity covering over 8 million square miles and having about 161 million inhabitants. This consists of the Russian Socialist Federation of Soviet Republics (R.S.F.S.R.), which comprises the greater part of the area (7½ million square miles) and includes a number of Autonomous Republics and Provinces, together with the Ukraine, Transcaucasia, White Russia, Turkmenistan, Uzbekistan and Tajikistan. Of this vast area, European Russia includes the *Ukraine*, *Transcaucasia*, *White Russia* and that part of the R.S.F.S.R. which reaches to the eastern boundary of Europe. Transcaucasia includes the small southern republics of *Armenia*, *Georgia* and *Azerbaijan*.

The boundaries of European Russia are the Arctic Ocean in the north; the Baltic States, Poland and Rumania in the west ; the Black Sea and Asia Minor in the south ; and the Ural Mountains, the Ural river and the Caspian Sea in the east.

Relief and Climate

The whole area is a vast plain broken only by the low ***Valdai Hills***. It rises in the south to the steep ***Caucasus Mountains*** between the Black Sea and the Caspian Sea and in the east to the ***Ural Mountains***, which have gentle slopes and rise to less than 6,000 ft. above sea-level. In the ***Caspian Depression*** around the Caspian Sea the land is below sea-level. Many long rivers flow across the plain, the main watershed being the Valdai Hills (see p. 329). The most important river is the *Volga* (see pages 288 and 345).

The climate is essentially continental on account of the large area, the distance from the sea and the absence of protective barriers; temperatures as extreme as −54°F. in winter and 109°F. in summer have been known. Rain falls mainly in summer and decreases from west to east, being very low in the Caspian depression. The great extent of the country from north to south necessarily gives the area a wide range of temperature and of climatic conditions, so that, while the extreme north lies within the Tundra, the southern Crimea has a Mediterranean type of climate.

Industries

European Russia has vast agricultural and mineral resources, and as a result of Five Year Plans, her output of both agricultural and industrial products is now in excess of her pre-war production. The first Plan, adopted in 1929, aimed at establishing key industries on a sufficiently large scale to produce supplies of mechanical power and basic materials, such as steel, cement, chemicals, cotton, wool, flax and hemp, needed to ensure the rapid industrialisation of the Soviet Union. It involved the reorganisation of agriculture into collective (or State) farms and the adoption of up-to-date methods, including the use of modern machinery. This Plan met with a considerable measure of success, more especially in the industrial field, and a Second Five Year Plan, even more ambitious than the first, has been put into operation.

An important feature of the Plans is the construction of large hydro-electric stations as, for example, at Dnieprostroi (near Alexandrovsk, or Zaporozhe, in the Ukraine), Svir (between Lakes Onega and Ladoga), Volkhovstroi (near Leningrad), and Tiflis, whilst further developments are taking place in the Urals and elsewhere. The output of coal, oil, peat, electricity, copper, cement, fertilisers and agricultural and engineering machinery industries has been more than trebled, while iron mining and steel manufacture have been re-established on a modern scale capable of greatly increasing their output.

Forestry. There are enormous timber reserves, in spite of the fact that much of the timber is at present inaccessible or of such poor quality that it will never be exploited, whilst the export of timber, particularly to the United Kingdom, is very large.

Agriculture. The country is the world's leading producer of wheat, barley, rye, flax and hemp, and is second in importance as a producer of oats and sugar-beet. In addition, there are millions of sheep and cattle, while the wool output is considerable, although not of good quality.

Minerals. Russia is second to the United States as a producer of mineral oil and is the world's leading producer of platinum and manganese, whilst there are extensive deposits of other minerals such as coal, iron-ore, gold, asbestos and salt.

These do not by any means exhaust the products of this remarkably rich country. In addition to those mentioned, potatoes, dairy products, cotton, maize, silver, copper and numerous commodities of minor importance are produced.

The Manufacturing Industries, too, are of increasing importance, and Russia has of late been importing large quantities of factory machinery and employing foreign skilled labour in order to increase the quality and quantity of her manufactures.

The Moscow Industrial Area is particularly important, having manufactures of textiles, metals, railway stock, leather and other industries, in addition to industries such as sugar-refining and flour milling. The cotton industry of this region has now become one of the most important in the world, obtaining its supplies of raw cotton from the Ferghana Basin of Central Asia. It is significant to note in this respect that the cotton area of this latter region has been increased to over 6 million acres, mainly as a result of railway developments, and that Russia is now producing almost sufficient raw cotton to satisfy her needs.

The coal and iron deposits of the Donetz Basin have given rise to the development of an iron and steel industry in that area, whilst *Leningrad*, in the north, has engineering and textile industries. *Tula* has local coal supplies and makes hardware. The great development of iron mining at Magnet Mountain in the southern Urals has led to the establishment and growth, at *Magnitogorsk*, of steelworks which rival those of Gary (Chicago), the largest in the world.

The main factors favouring the expansion of manufacturing industries in Russia are the supply of cheap labour and the abundance of raw materials and minerals. At the moment the great drawbacks to their expansion are lack of capital and inadequate transport facilities. The development of an efficient railway system is, indeed, probably the most important factor to which attention will have to be given. The Second Plan proposes to increase the railway mileage by 20,000, but, even if this is accomplished, railway transport will still be inadequate. In one respect, however, the communications of Russia are up-to-date, for there is a large and efficient organisation of air transport, and it is intended to use aeroplanes for light freight, passenger and mail traffic to remote districts.

Natural Regions of European Russia

The distribution of the main agricultural and mineral products of European Russia is best explained by a description of the natural regions of the country, which include (1) the Tundra; (2) the Coniferous Forest Belt; (3) the Deciduous and Mixed Forest Belt; (4) the Steppe Region; (5) the "Black Earth" Region, really a sub-division of the Steppe Region; (6) the Mediterranean Region; (7) the Caspian Depression; (8) the Urals, and (9) the Caucasus. These divisions, except the highland regions, are indicated in Fig. 161.

The Tundra region of northern Russia differs from that of similar regions in other countries because it has in *Murmansk* an ice-free port due [illegible] the influence of the North Atlantic Drift. The port is connected by rail to Leningrad.

Archangel, situated further south in the White Sea, at the mouth of the Northern Dwina, is another port of this region, trading chiefly in timber, fish and furs. It would undoubtedly be a highly important port were it not that its harbour is blocked by ice for several months of the year, although navigation has been extended by the use of ice-breakers.

The Coniferous Forest Belt, with its cold temperate climate, lies immediately south of the Tundra. Lumbering is the chief occupation, the chief trees being the pine and the birch. North-east of Leningrad around Lakes Onega and Ladoga some flax and rye are cultivated.

The leading town is *Leningrad*, formerly the capital of Russia, situated on the River Neva at the head of the Gulf of Finland. It is Russia's leading seaport and has numerous manufactures, though, with the exception of the iron and steel industry, these are not highly important, as the town is too near the forest region and too far from the wheat belt

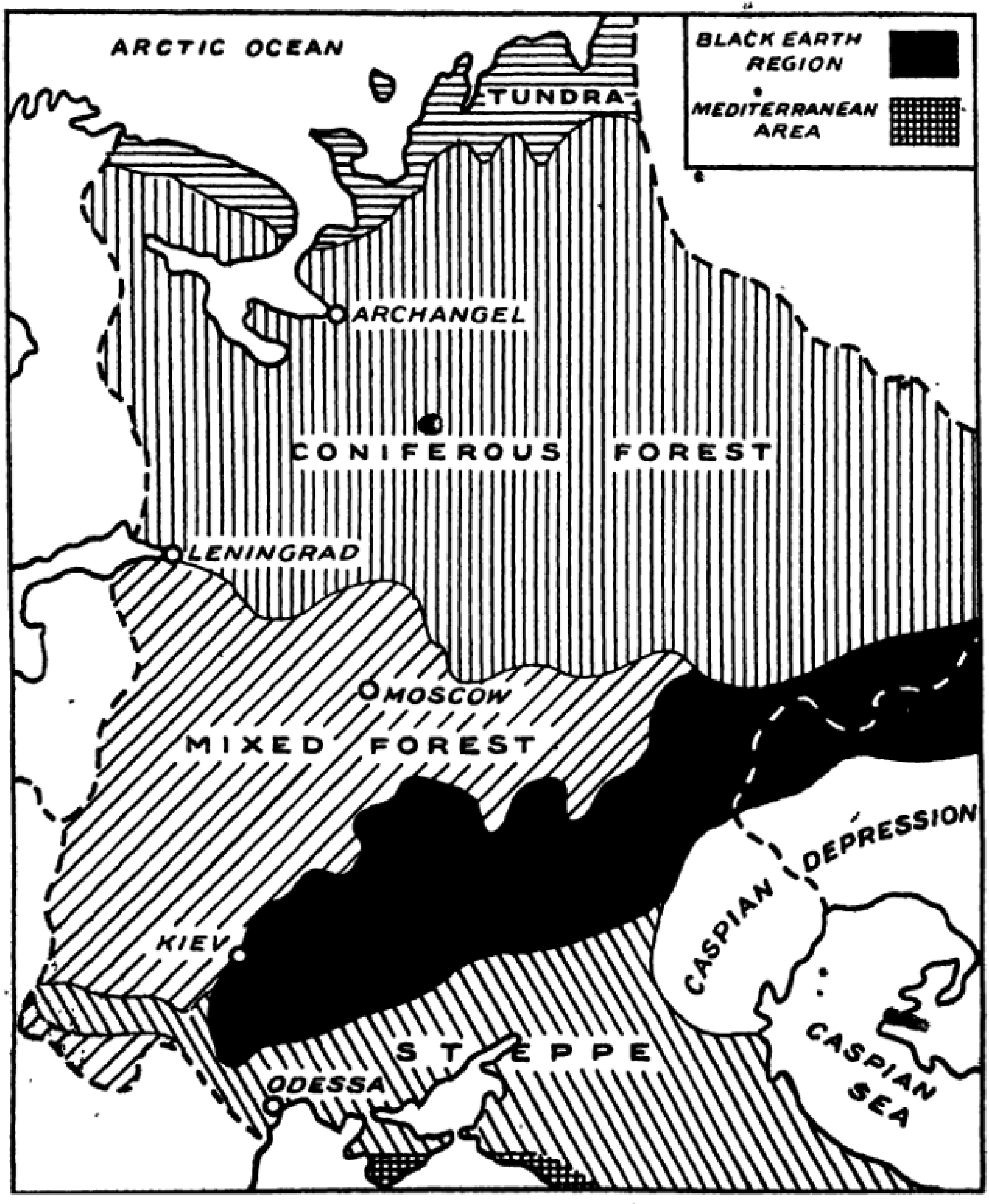


Fig. 161 : The Natural Regions of European Russia.

to be the centre of a densely populated region. The development of hydro-electric power at Svir and Volkhovstroi should, however, increase the importance of the manufacturing industries.

THE DECIDUOUS AND MIXED FOREST BELT has been largely cleared and agriculture is the predominant industry. The leading crops are rye, flax, barley, oats, potatoes and hemp. The raw materials—hemp, flax fibre and linseed—are exported, but the food crops are insufficient for local needs, additional supplies being obtained from the Black Earth region.

Situated in the centre of the deciduous forest belt is the Moscow industrial region, which, in addition to its coal deposits and central situation already mentioned, has the advantages of large supplies of local raw material and a local market. The local supplies of coal are of poor quality so that additional supplies are obtained from the coalfield in the Donetz valley.

Moscow, the capital of European Russia and of the U.S.S.R., has a population of over 3½ millions and is Russia's leading railway and manufacturing centre. It owes much of its importance to its central situation and to the fact that coal is available not far away on the Tula field. It is well-connected with Leningrad, the chief port.

THE STEPPE REGION, as its name implies, is a typical continental grassland region, with cold winters, hot summers and a light rainfall. These treeless plains support vast numbers of cattle and sheep, tended by nomads. In the wetter parts wheat and maize are cultivated. The most important part is the area known as the "Black Earth" region.

THE "BLACK EARTH" REGION of the Ukraine is a loess-covered, very fertile region constituting one of the most important and richest wheat producing areas in the world. The wheat is exported from the Black Sea ports of *Odessa*, near the mouth of the Dniester (which also trades in wool, hides, tallow and flour); *Kherson* at the mouth of the Dnieper; and *Nikolaev* at the mouth of the Bug. Each of the rivers mentioned forms a convenient means of transport, supplementing the rail routes which serve the agricultural areas. At *Dneiprostroi* the development of hydro-electric power on the Dneiper has caused the production of aluminium to assume considerable importance.

In addition to wheat, other crops such as sugar-beet, barley, rye, oats and maize are cultivated. The leading inland agricultural centres are *Kiev*, on the Dnieper, with an important arsenal also, and *Kharkov*, the capital of the Ukraine. Both of these have metallurgical industries based on the proximity of iron ore and manganese supplies at *Krivoi Rog* and *Nickopol*, respectively, and of coal from the Donetz Basin coalfield to the south. Here, lignite, bituminous coal and anthracite are all found and the field supplies two-thirds of the total coal production of the country and the only coal in Russia suitable for coking.

THE MEDITERRANEAN REGION of the southern Crimea has been referred to in Chapter 21.

THE CASPIAN DEPRESSION is the area, lying below sea-level, which surrounds the northern end of the Caspian Sea. It is an area of inland drainage with low rainfall, scrub vegetation, and large infertile tracts covered with reed swamps and brine deposits. *Astrakhan*, near the mouth of the Volga, is a fishing port and handles the bulk of Russia's trade with Persia.

THE URALS, another of the regions referred to in Chapter 21, are important for their mineral wealth and the available water-power, which is now being utilised.

The chief town of the region is *Perm*, situated on a tributary of the Volga, in the centre of the iron region. It is a station on the railway from Leningrad to Siberia. *Magnitogorsk* has grown amazingly as a result of the development of a large iron and steel industry based on the iron ore mined at Magnet Mountain. The coke is obtained from Kuznetsk (Siberia), whither iron ore for the Kuznetsk iron and steel industry is shipped as return freight.

THE CAUCASUS. The main characteristics of the mountains have been briefly described in Chapter 21, but it is convenient to include in this region the three Transcaucasian States of Armenia, Georgia and Azerbaijan.

'83

Armenia (*area* 11,945 sq. miles; *population* 1,000,000) has fertile plains and valleys in which are grown the mulberry, cereals and textile fibres. There is extensive mineral wealth, including copper (the most important), sulphur, nitre, bitumen, naphtha and marble. *Erivan* is the capital.

(120)

Georgia (*area* 26,381 sq. miles; *population* 3,000,000) produces wine, tobacco, timber, manganese, coal and oil, whilst there is much water power which is now being developed. Manganese is the leading mineral, the chief centre being Chiatura. The capital is *Tiflis*, which has a large hydro-electric station.

Azerbaijan (*area* 32,686 sq. miles; *population* 2,500,000) is important for its production of petroleum around *Baku*, the capital, situated on the Caspian Sea, whence the oil is carried by pipe-line to *Batum* on the Black Sea for export to Europe. Agriculture also is extensively practised, grain, cotton and the vine being cultivated. Caviare is an important and profitable product of the fisheries of this area.

Communications and Commerce

The rivers of European Russia are of great value as a means of communication during the summer months, although of little use in winter, when they are mostly ice-bound. The Volga is navigable to within 75 miles of its source, but, although it transports a large volume of goods, it has two great disadvantages—it is frozen for about 200 days each year, and its basin is gradually drying up. A further drawback is that deforestation is causing erosion of the banks. In spite of these handicaps, the river carries the greater part of the U.S.S.R. commerce in grain, timber and other heavy goods. The Volga is joined to the Neva by canal.

Moscow is the great, centrally situated railway centre of European Russia and has numerous important lines radiating to Warsaw, the Black Sea, Leningrad, Archangel, Siberia and Turkestan. Leningrad is connected with Helsingfors, Berlin and Warsaw. There is, on the whole, a lack of transport facilities in European Russia, in spite of the fact that there are no great physical obstacles to be overcome.

Air routes are developing rapidly, the total air mileage (including Asiatic Russia) being over 30,000 miles.

Commerce. But for the decline in world values since 1929–30, it is probable that Soviet Russia would by now have a foreign trade as large as that of 1913. As the foreign trade of the country is organised as a State monopoly, the import and export of goods is possible only by means of special licences, and the trade is confined to those State and co-operative organisations appointed by the State.

The *imports* consist of ores, metals and machinery (about 60 per cent.), electrical and engineering goods, textiles and foodstuffs. The leading *exports* are metallurgical products (including mineral oil), timber and its products, agricultural products (such as wheat, butter and flax), fish and furs. Germany and Great Britain have the largest shares in the trade.

SWITZERLAND

Area: 15,940 sq. miles. *Population:* 4,100,000.

Switzerland is entirely cut off from the sea, being bounded by Germany on the north, France on the west, Italy on the south and Austria on the east. It therefore depends entirely on railways for the bulk of its trade with the world outside its boundaries.

Relief and Climate

The country is everywhere high, there being little land below 600 ft., and in parts it rises to over 10,000 ft. There are three main physical divisions—the *Alps* in the south-east; the *Central Plateau* in the centre; and the *Jura Mountains* in the north-west. The mountains are the source of many rivers which assume great importance after they have left Switzerland. These rivers generally make longitudinal valleys, *e.g.*, the *Rhône*, the *Rhine* and the *Inn*, but the *Aar* and the *Ticino* cut through the land in transverse valleys. The mountains also contain numerous lakes set in beautiful surroundings.

The climate of Switzerland may be described as continental with considerable local modifications due to varying elevation and topography. In winter the country is mainly snow-bound, but the warm, dry, bracing sunshine attracts thousands of visitors. The valleys facing south have higher average temperatures than those facing north, so that crops can be grown in the former which could not exist in the latter. Rain falls at all periods, though it is heaviest in summer, while precipitation in winter is, of course, in the form of snow. A striking characteristic of the Swiss climate is the influence of the *Foehn*, which blows from the alpine heights as a warm wind and serves to melt the snows and make available pasture which otherwise would be inaccessible.

Industries

Switzerland is hampered by a complete absence of raw materials and minerals, but considerable progress has been made in the utilisation of water power for manufacturing purposes.

AGRICULTURE is practised on the Alpine foreland, where glacial deposits have produced areas of fertile soil. Here the hardier cereals such as rye and oats are grown, while the vine is cultivated in the more sheltered valleys. The most important occupation is *pastoral farming*, and there is a considerable export of cheese, chocolate, condensed milk and leather. The cattle feed on the mountain pastures in the summer months but have to retreat to the valleys during the winter.

Vevey is the centre of the famous Nestlé's milk and chocolate industry, whilst Gruyère and Emmenthal are the leading cheese centres.

MANUFACTURES of silk and cotton are carried on at Zurich, Berne and Basel, important factors in the foundation and rise of these and other industries being the importation of cheap Italian labour, the efficient technical education for which the Swiss are famous, the central position of the country in relation to European markets, and the abundance of water power.

The other manufactures consist of such commodities as wooden toys, " nick-nacks " and ornaments in the forest areas ; electrical machinery at Zurich, Basel and Berne ; clocks and watches at Neuchâtel, Geneva and other places ; chemicals at Basel, and motor-cars. In general, the Swiss products have high value for comparatively small bulk, and are thus able to bear the freight charges necessary to carry them to their markets in other countries as well as in Switzerland itself.

The beauty of the numerous lakes set amid the grandeur of the snow-clad peaks, and the health-giving properties of the pure mountain air, have given rise to a considerable *tourist traffic*. Although this is naturally much heavier in summer than at any other time of the year, great numbers of people visit various parts of Switzerland during the winter for the winter sports which are organised on an extensive scale.

Communications, Towns and Commerce

The Swiss rivers are useless for navigation whilst the relief makes canal construction on any extensive scale quite impossible. Hence, despite the great physical difficulties which have had to be overcome, railway development has been considerable; the system is electrified and is constantly being modernised. Every advantage is taken of valley routes and of the Alpine Passes, several of which serve important transcontinental services (see Figs. 156 and 163 and Chapter 18). Switzerland now has in all about 3,500 miles of line.

Berne, the capital, is situated on the Aar. It is an important railway centre and has manufactures of silk, cotton and electrical machinery. *Zurich*, on the north-east of the plateau, is the largest town, with manufactures similar to those of Berne. *Geneva*, at the southern end of the Lake of Geneva, makes watches and general machinery. It is the headquarters of the League of Nations. *Basel* commands the Belfort Gap and is an important railway centre, with silk, cotton, machinery and chemical industries.

The chief *exports* of Switzerland are silk and cotton goods, watches, clocks, machinery, dairy produce, hides, skins and dyes. The *imports* consist of cereals and other foodstuffs, raw cotton, raw silk, raw wool, minerals, chemicals, metal goods and coal.

The principal trading countries are Germany, Great Britain, the United States, France and Italy.

CZECHOSLOVAKIA

Area: 54,226 sq. miles. *Population:* 15,000,000

Czechoslovakia is an inland country and is bounded by Germany on the west; Germany and Poland on the north; Austria and Hungary on the south; and Rumania on the east. The country consists of the former Austrian territory of Bohemia, Moravia and part of Silesia, together with the Carpathian lands which formerly belonged to Hungary.

Relief and Climate

The physical divisions comprise the *Bohemian Massif* in the west, the *Carpathians* in the east and the *Moravian Lowlands*, between the highland areas. The river *Elbe* drains the Bohemian block to the north, while the Carpathian rivers drain south to the Danube. The climate is continental with very severe winters. The heavier precipitation naturally occurs in the higher parts, there being heavy snowfall on the Carpathians in winter, although central Bohemia is comparatively dry at this season.

Industries of Czechoslovakia

As Czechoslovakia embraces the rich industrial and commercial parts of the former Austrian Empire, it is easily the most important of the Central European states.

AGRICULTURE is conducted on intensive lines in Bohemia and Moravia. Sugar-beet and hops are important, and wheat, rye and potatoes are cultivated, whilst maize, the vine and fruits are grown in the Moravian lowlands. On the Carpathians are valuable *forests*, which yield several varieties of timber, chiefly coniferous, and support typical timber industries such as furniture-making.

MINING. The mineral wealth is extensive, coal being found in Bohemia (around Prague and Pilsen) and in Moravia; iron ore near Prague and Pilsen, in Moravia and in the Carpathians; salt in Slovakia; and oil in Moravia.

MANUFACTURES of iron and steel are centred at Prague, Pilsen, and Kladno; textiles are made in the upper Elbe basin and in Moravia; glass manufacture is highly important around Prague, while brewing is important at Prague and Pilsen. Pencil-making from local supplies of wood and graphite is another valuable industry in Bohemia, while deposits of good china clay near *Karlsbad* have given rise to an important pottery industry. (See Chapter 14.)

Natural Regions of Czechoslovakia

The country can be divided into three natural regions corresponding to the main physical divisions already mentioned.

THE BOHEMIAN MASSIF has a continental type of climate and is drained by the Elbe and its tributary the Moldau. The southern part of this region is infertile and supports poor crops of barley, oats, rye and potatoes and a pastoral industry. Most of the land is forested.

In the north, in the Elbe and Moldau valleys, is a fertile alluvial area producing large crops of sugar-beet, wheat, hops and potatoes.

Central Bohemia has large coal (hard and lignite) and iron deposits, whilst silver also is found. The presence together of coal, iron, water power and local raw materials has naturally caused central Bohemia to develop as an important industrial region. The hops supply the raw material for the brewing industry; sugar-beet for the sugar-refining industry; coal and iron for the iron and steel industry; the forests for the paper and pulp industry; and clay and sand for the glass industry. There are also textile and chemical industries.

The leading mining and industrial centres are *Prague*, the capital, situated on the Moldau, a tributary of the Elbe, in the centre of the Bohemian Plateau; and *Pilsen* on a tributary of the Moldau, at the foot of the Bohmer Wald. The main outlet of this region is *via* the Elbe Gap to Hamburg (see Fig. 162).

THE CENTRAL VALLEYS, or Moravian lowlands, are a fertile area growing barley, sugar-beet, rye and oats in the north, and producing maize, vines and fruits in the south. Some parts are forested and yield the usual timber products.

Coal is found to the west of *Brno* (*Brünn*) and in the north, where the Silesian field extends into the country, around *Opava* (Troppau), a fortress town on the Oppa river, and *Ostrava*, on a tributary of the Oder in the valley between the Sudetes and the Carpathians. Textiles and machinery manufactures are important at both these towns and on the coalfield generally.

Fig. 162 shows that this region has two outlets, (1) *via* the Moravian Gate and the Oder to Stettin; and (2) *via* the March and the Danube through the Danubian river port of *Bratislava* (Pressburg or Pozsony) to the Black Sea.

The Carpathian Region consists of highlands in the north and lowlands in the south. In the latter region, barley, sugar-beet and potatoes are cultivated, while to the north pastoral farming is practised. Lignite and iron ore are widely distributed but are not extensively worked. The existence of timber and water power in the Carpathians is causing the timber industry to become of considerable importance. The region has no large towns.

Communications and Commerce

The *Elbe* (see p. 347), flowing north to the North Sea at Hamburg, is vitally important to the trade of Czechoslovakia and, mainly for this reason, has been internationalised. The *Oder* provides an outlet through the *Moravian Gate* into Germany and Poland, while the *March* and the *Danube* form the water highroad southwards and to the Black Sea (see Fig. 162).

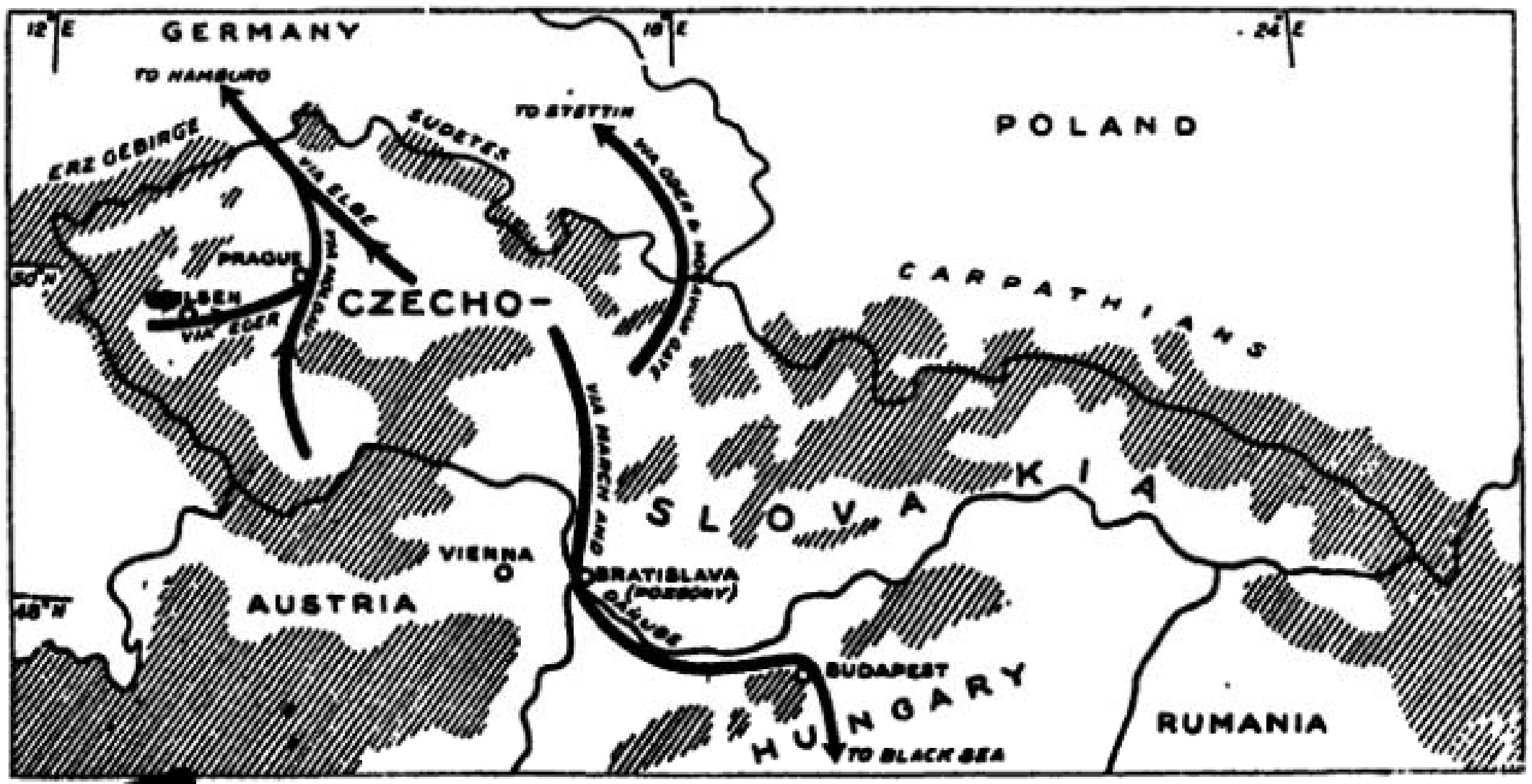


Fig. 162: Outlets of Czechoslovakia.

(Highland shaded.)

Czechoslovakia suffers from the disadvantage that, when the country formed part of pre-war Austria-Hungary, the railways were made to focus on Vienna and Budapest, and at present there is no great east-west railway lying wholly within the country. New lines, many of which are electrified, are nevertheless developing rapidly, with Prague as the centre.

Czechoslovakia's principal *exports* are textiles, glass, iron and steel goods, coal, cereals and sugar. The *imports* consist mainly of cottons, woollens and cereals.

Trade is carried on largely with Germany, Austria, Great Britain, Yugoslavia and the United States.

AUSTRIA

Area : 32,369 sq. miles. *Population :* 6,700,000.

Austria lost so much valuable territory after the Great War of 1914–18 that it is now only a small inland country. It is surrounded by Italy, Switzerland, Germany, Czechoslovakia, Hungary and Yugoslavia, and its only outlet to the sea is *via* the River Danube to the almost enclosed Black Sea.

Relief and Climate

All the land is over 600 ft. above sea-level, except the plain where the *March* joins the *Danube* in the extreme east. The Alps in the south-west are over 10,000 ft. high. The physical divisions include the low-lying *Danubian region* around Vienna in the north and the high *Alpine* area in the south (including the Austrian *Tyrol* in the west).

The climate is one of extremes as a result of continental situation, with the heavier rainfall in the Alpine region. The eastern valleys experience the greatest extremes of temperature, whilst the southern valleys are the warmest parts in winter.

Industries

AGRICULTURE is important in the north, the chief crops being potatoes and turnips, while FORESTRY is important in the south. In the Alpine valleys, cereals, the vine and the mulberry are cultivated. The output of foodstuffs, however, is insufficient for local needs.

MINING is not very important, but iron, lignite, copper, salt, lead and zinc are found.

MANUFACTURES are based on the minerals and on water power. Iron is smelted, notably at Eisenerz. There are lead works in Carinthia whilst machinery, cutlery, tools, cotton goods, silk goods, pianos, motor-cars and furniture are made in different parts of the country.

Communications, Towns and Commerce

The *Danube* (see p. 345) is extremely important as a commercial highway in Austria as in the other countries through which it flows.

At various points it is supplemented by canals. *Vienna* (see p. 221) the capital, is the railway, commercial and industrial centre, from which lines run to Budapest (Orient Express), Prague, Munich and Lombardy. Once one of the most brilliant and beautiful towns of the continent, Vienna has lost much of its old glory since the break up of the Empire of which it was the administrative, commercial and diplomatic centre.

Graz, on the Mur in Styria, is Austria's second largest town. Local supplies of iron-ore have made it the centre of a considerable iron-smelting district.

Raw materials, manufactured goods, foodstuffs and fuel are *imported*, while the principal *exports* are manufactured articles and timber.

Trade is carried on mainly with Germany, Czechoslovakia, Hungary and Yugoslavia.

HUNGARY.

Area : 35,875 sq. miles. *Population :* 8,700,000.

Hungary, like Austria, is now a small inland country bordered by Austria on the west, Czechoslovakia on the north, Rumania on the east and Yugoslavia on the south.

Relief and Climate

The country consists of a central plain surrounded by high land, the *Danube* forming a north-south drainage with the *Tisa* as the chief tributary from the Carpathians. The two plains of Hungary, the Great and the Little, are separated by the *Bakony Wald*, through which the Danube has forced a passage. In the west is *Lake Balaton*. The climate is of the continental type, with local variations due to differences in relief.

Industries

The plains are very productive, being covered with alluvial soil in most parts, whilst other parts are marsh or steppe, providing excellent grass for pasturage.

AGRICULTURE is the principal industry and wheat the chief crop, followed by maize, rye, barley, oats, potatoes, beet, tobacco, flax, hemp and hops. *Cattle rearing* by scientific methods is important and wine is produced.

MINING AND MANUFACTURES. Small quantities of poor *coal* are mined, and the few *manufactures* consist mainly of flour milling, distilling, iron and steel and sugar industries. Hungary is world famous for the quality of her wheat and the excellence of the flour made therefrom.

Communications and Towns

The *Danube* (see p. 345) is much used for local traffic and its navigation is improved by canals.

Budapest, the capital, situated where the Danube breaks through the Bakony Wald, is naturally the railway centre. It is connected with Trieste in Italy, the old port of Hungary on the Adriatic, with Bucharest (Rumania), and is on the Orient Express route from Vienna to Belgrade and Constantinople. It has flour mills, sugar and tobacco factories, iron and steel works, electrical and textile industries.

Most of the towns are agricultural markets and only three, *Budapest*, *Szeged* and *Debreczen*, have over 100,000 inhabitants.

Commerce

Hungary's principal *exports* consist of wheat, flour, animals and electrical machinery. The principal *imports* are timber, textiles, coal, paper and petroleum.

Trade is carried on mainly with Austria, Czechoslovakia and Germany.

RUMANIA

Area : 122,282 sq. miles. *Population :* 18,000,000.

Rumania is bounded by the Ukraine, Poland and Czechoslovakia on the north ; Hungary and Yugoslavia on the west ; Bulgaria on the south ; and the Black Sea on the east.

Relief and Climate

There are two notable physical divisions ; (*a*) the upland area in the north-west consisting of the southern *Carpathians* (known as the *Transylvanian Alps* in this part) ; and (*b*) the plains of *Wallachia* and *Moldavia* in the south and east. The main drainage is centred on the *Danube*, which flows south of the Transylvanian Alps and then turns north across the plain before emptying into the Black Sea. There are several tributaries from the uplands and the *Pruth* joins the main stream on the plain.

The climate of Rumania is typically continental, the summers being hot, the winters cold and rainfall occurring mainly in summer. There are, of course, local variations due to differences in relief.

Industries

Agriculture. The plain area is very fertile, and agriculture, the main pursuit, employs 90 per cent. of the population. Maize is the chief crop, followed by wheat, barley and oats, while plums and the vine are grown. Cattle are reared on the lowlands, and pigs in the pine, oak and beech forests of the highlands.

MINING. The country is rich in *minerals*. There are extensive supplies of petroleum, mainly along the foothills of the Carpathians, and this is conveyed in pipe lines to Constantza on the Black Sea for export. Salt is obtained from the lower Carpathians, while iron ore, copper, lead, silver, gold and coal are mined in Transylvania and the Banat.

MANUFACTURES. The only manufactures are those based directly on agricultural products, such as flour-milling and brewing.

Communications and Towns

The *Danube* is of considerable local importance, being easily navigable to the "Iron Gates," the gap between the Transylvanian Alps and the Balkans.

Bucharest, the capital and the centre of the grain district of Wallachia, is the main railway centre, and lines run from there to Constantza on the coast and round the Transylvanian Alps to Budapest.

Constantza (Kustenje), on the Black Sea, is the chief port and the only one that is ice-free throughout the year. It exports oil, grain and cattle. *Galatz* and *Braila* are Danubian river ports.

Kishinev is an important wheat collecting centre in Bessarabia and is connected by rail with Odessa, the Ukraine wheat port on the Black Sea, as well as with Galatz, the Rumanian outlet.

Commerce

The main *exports* are wheat, maize, petroleum, timber and live stock; the *imports* are textile materials, iron and steel, machinery, metals, vehicles and leather goods.

The principal trading countries are Great Britain, Germany, France, and Italy.

THE BALKAN STATES

The Balkan States lie between the Black Sea and the Adriatic Sea, and comprise Yugoslavia, Bulgaria, Albania, Greece and Turkey-in-Europe.

Relief and Climate

The Balkan Peninsula is very mountainous, most of the land being more than 1,500 ft. above sea-level. The four main mountain ranges are the *Dinaric Alps* in Yugoslavia, the *Pindus Mountains* in Greece, the *Rhodope Mountains* in southern Bulgaria and the *Balkans* in northern Bulgaria. The chief lowland areas are those parts which lie within the Danube basin and the Maritza plain.

The principal rivers of the region are the *Maritza*, which flows from the Balkans in a south-easterly direction to the Aegean Sea, and the *Vardar*, which rises in the western mountains and flows south to the Gulf of Salonika. The *Danube* forms part of the northern boundary and flows through the north-east of Yugoslavia. The coastline of Yugoslavia and Greece is very rugged and numerous islands lie off the shore.

The climate of this region is on the whole typically Mediterranean, with certain modifications due to altitude. The higher land receives about six inches of summer rain, but considerably more falls in winter, the Dinaric Alps being the wettest portion. In the north-east the climate becomes moderately continental in character (see also p. 343).

Industries

BULGARIA (*area*: 39,814 sq. miles; *population*: 6 millions) is at present mainly an agricultural country, the principal products being wheat, maize, barley, rye and sugar-beet in the north; and fruit, the vine, silk and tobacco in the south. A notable product is the scent known as attar of roses produced in the narrow valley of the Tundja river. Part of the country is forested whilst other parts support pastoral occupations.

The country is rich in coal, but as yet there has been little mining development.

The leading exports are tobacco, eggs, wheat, maize, attar of roses and silk. Trade is carried on mainly with Germany and Austria.

ALBANIA (*area*: 10,629 sq. miles; *population*: 1,000,000) is a small mountainous kingdom in which much of the land is uncultivated. Cattle- and sheep-rearing is the main industry, the wool from the latter being made into coarse cloth. There is much forest and mineral wealth awaiting development.

Tobacco manufacture, dairying, flour-milling and cheese making are also carried on, although the country is unimportant commercially.

YUGOSLAVIA (*area*: about 95,558 sq. miles; *population*: 14,000,000) is otherwise known as the "Kingdom of the Serbs, Croats and Slovenes." It includes *Serbia*, *Montenegro*, *Bosnia*, *Herzegovina*, *Dalmatia*, *Croatia*, *Slavonia*, *Slovenia* and the north-eastern territories (including part of the *Banat*) known collectively as the Voyvodina.

Agriculture is the chief occupation, vines, plums (for prunes), wheat and maize being cultivated, while natural silk (from silkworms reared on the mulberry tree) and hemp are important. Barley, rye and oats also are grown. Forests of beech, oak and fir occur mainly in Bosnia and Herzegovina, whilst the pastoral industry is widespread.

Mining. Coal and iron are mined in Bosnia; copper at Bor (Serbia); lead in Slovenia; chrome at Uskub; quicksilver in Carniola, and antimony in Serbia; but all the minerals are little developed.

Manufactures. The principal manufactures are flour-milling and brewing, whilst *Pirot* is noted for carpets.

Commerce. The leading *exports* are timber, maize, eggs, pigs, meat and cattle.

/ 132)

GREECE (*area:* 50,257 sq. miles; *population:* 6,600,000) is chiefly an agricultural country, cultivating wheat, vines, currants, barley, maize, oats and olives. Currants and olives are of considerable importance. Iron, lead, lignite, zinc, and chrome are mined.

The principal *manufactures* are those concerned with the production of olive oil, textiles, chemicals, leather, soap and wine.

Commerce. Greece has a larger volume of commerce than the other Balkan States. Currants form the staple *export,* while olive oil also is important. *Imports,* which exceed exports in value by about 100 per cent., consist mainly of manufactured goods.

The principal trading countries are Germany, Italy, the United States and the United Kingdom.

CRETE is a Greek island lying in the Mediterranean to the south-east of Greece. It is mainly mountainous, with Mount Ida rising to over 8,000 feet above sea-level. The small valleys are very fertile and produce wheat, oranges, lemons, olives and grapes. The cypress flourishes, sheep are bred for wool and the coastal waters provide sponges. The island lies on the route of the air service from Britain to Cape Town.

Candia is the chief town and port.

TURKEY-IN-EUROPE consists of the territory enclosed by the Maritza on the west and a line running eastwards from the north of Adrianople to the Black Sea. The zones adjoining the European frontier, together with the Dardanelles, the Sea of Marmara and the Bosporus, are demilitarised, thus providing free access to the Black Sea for all nations. Apart from the fact that *Istanbul,* or Constantinople, wonderfully situated on the Bosporus (see p. 222), is of military significance and the terminus of the Orient Express route from Western to Eastern Europe, this small area is not very important.

Communications and Towns of the Balkans

The configuration of the Balkans makes east-west communication difficult, but north-south routes take advantage of such river valleys as those of the Maritza and the Vardar. Of the railways the most notable is the eastern part of the Orient line, which comes from Hungary *via* the Morava and Maritza valleys to Adrianople and Istanbul (see p. 270). Salonika and Adrianople are also joined by a railway along the coast.

Of the Balkan towns, *Istanbul* has already been mentioned. *Adrianople* (Turkey), on the Maritza, is an agricultural centre and has silk, rug and leather manufactures. *Belgrade,* on the Danube, is the capital of Yugoslavia and is an important railway junction. *Nish* (Yugoslavia) is a railway centre and *Uskub* (Yugoslavia), an agricultural and mining centre. *Salonika* (Greece) is the port for the Vardar basin and stands at the coastal end of the route through the Balkans from Belgrade.

Sofia, the capital of Bulgaria, is the centre of an important fruit-growing region and is on the Orient railway. *Philippopolis* (Bulgaria) is an agricultural centre in the Maritza valley. *Rustchuk* is a Danubian river port and *Varna* a Black Sea port, both in Bulgaria.

Athens, the capital of Greece, is more noted for its historical significance than for any present importance. Its port is *Piræus*, where goods are loaded by lighters. *Corinth* is the chief port of Greece and has an important trade in currants, to which commodity it has given its name. *Patras* is a west coast port of Greece. *Tirana* is the capital of Albania.

ITALY

Area: 119,710 sq. miles. *Population*: 42,200,000.

Italy consists of a northern mountain area and a northern plain area with a long peninsula stretching south-east into the Mediterranean Sea. It is bounded on the north-west and north by the Alps, which separate it from France, Switzerland and Austria; on the west by the Tyrrhenian Sea; on the south by the Ionian Sea; and on the east by the Adriatic Sea.

Relief and Climate

The country is easily divisible into three physical and climatic regions, which also comprise the main natural regions: (1) the Alpine Slopes of the north; (2) The Plain of Lombardy; and (3) the Peninsula.

(1) THE ALPINE SLOPES. Here the temperature varies with altitude and there are numerous sheltered valleys with a mild winter and heavy rainfall.

(2) THE PLAIN OF LOMBARDY. As this lies within the semi-circle of the Alps, it is cut off from the influence of the Westerlies, and has a continental climate. The rainfall approximates to the Mediterranean type but is more evenly distributed throughout the year.

The Plain of Lombardy has been built up partly as a result of the uplifting of land formerly covered by sea, and partly by the age-long deposit of alluvium brought down by the Alpine rivers. It is drained from west to east by the river *Po*, around the delta of which land is still being added by the deposit of silt and alluvium in the Adriatic.

(3) THE PENINSULA stretches south-east from Lombardy through more than 5° of latitude and is occupied largely by the Apennines, which form a mountainous backbone for the whole of the peninsula. It experiences a Mediterranean climate, with heavier winter rainfall to the

west of the mountains (see also p. 343). The peninsula may be subdivided into (1) the Northern Apennines; (2) the Central Apennines; (3) the Southern Apennines; (4) the West Coast Region; and (5) the East Coast Region.

Throughout their great length the Apennines leave only narrow coastal plains on each side except where rivers have extended the lowland areas seawards. The most extensive lowland areas are in Apulia (the heel of the foot) and around Pisa, Rome (the Pontine Marshes), Naples and Foggia (on the East).

The island of *Sicily* in the extreme south is almost wholly mountainous and volcanic, containing the picturesque but most destructive *Mount Etna*. The island of *Sardinia*, to the west, has undeveloped mineral resources.

Industries

AGRICULTURE. Nearly 75 per cent. of the land in Italy is given over to agriculture, the Plain of Lombardy being the most fertile area. Here the principal crops are wheat, maize (by irrigation), beans, oats, and rice (in the swampy delta of the Po and elsewhere with the aid of irrigation). The mulberry tree, also, is widely grown in this region for the rearing of millions of silkworms. Italy is one of the world's great silk-producing countries, and three-quarters of her output of natural silk is produced in the Lombardy Plain.

In the valleys and on the lower slopes of the Alpine area the olive, vine, fig and other fruits are cultivat[illegible]ilst the higher slopes support a pastoral industry. Parmesan and Gorgonzola cheeses are well-known products of the rich meadows along the middle and lower course of the Po. The mulberry also is grown and there is some development of the large available supplies of water power.

In the peninsula the most important crops are the vine and the olive, which, together with other Mediterranean fruits, are grown on the lower slopes of the Apennines. Macaroni, a highly important food of the Italian people, and a valuable export, is produced throughout the country but especially at Naples, Genoa, Leghorn and Turin. In Apulia, where the hard wheat necessary for macaroni is extensively cultivated, there is also a considerable industry. Sicily is extremely productive of all the typical Mediterranean crops but is particularly noted for its lemons and Marsala wine.

MINING is not very important in Italy. There is a notable lack of coal, and, though some iron, manganese, and copper are mined in Sicily and Tuscany, the output is insignificant. In Elba (an island off the north-[illegible]t coast of the peninsula) there are considerable deposits of good quality iron ore, which is used in the shipbuilding yards at Spezia and Genoa. Marble of wonderful quality is obtained from the world-famous quarries at Carrara, while sulphur is mined and exported from Sicily and other volcanic areas. Idria (Carniola) is one of the world's chief sources of quicksilver.

MANUFACTURES. As a result of the absence of coal and iron, Italy's manufactures have developed but slowly, though this handicap has been partly overcome by the use of electricity derived from water power, particularly in the Po Valley—the chief industrial region. The cotton industry flourishes in Milan, Genoa and Turin; silk manufactures (including artificial silk) are highly important in Lombardy (Milan, Como and Brescia), Piedmont (Turin and Novara), Venetia (Venice) and Naples; while woollens are manufactured at Milan. Italy, originally the main source of *natural* silk, is now an important manufacturer of artificial silk.

Engineering is important in Milan, Terni and Genoa (steel, locomotives); Turin (motor-cars); and Venice and Spezia (shipbuilding). Venice is also noted for lace and glass-ware.. Hats are made at Florence. The output of wine in Italy is exceeded only by that of France, the most noted brands being Marsala (Sicily), Asti (Piedmont) and Chianti (Florence). As the Italians are great wine drinkers, most of the wine produced is consumed at home, and only a very small proportion is exported.

Communications and Towns

The Alps form a great barrier to the flow of trade between Northern Europe and Italy, so that the importance of the passes and tunnels to that country can scarcely be over-estimated. The tunnels have been constructed in the face of immense difficulties, but through them railway routes focussing on Milan and Turin bring Italy into the closest contact with all her European neighbours. In order, from west to east, the most important passes and tunnels are: (1) The *Mont Cenis* tunnel, linking the Rhône valley with Turin and the Po valley; (2) The *Lötschberg* tunnel and the *Simplon* tunnel, providing routes from Berne and Geneva *via* the Rhône valley and the Toce valley to Milan; (3) the *St. Gothard* tunnel linking the valleys of the Reuss and Ticino; (4) the *Brenner Pass*, joining the Adige and Inn valleys; and (5) the *Semmering Pass*, giving access from the Danube valley to the Gulf of Venice (see Figs. 130 and 163). A trans-Alpine road passes over the *Great St. Bernard Pass*.

Thanks to its position at the foot of the Alps and at the head of the rich Lombardy Plain, Milan is an important junction for railways traversing the Alps from Germany and Switzerland by the Simplon and St. Gothard routes. Turin is on the route from France *via* the Mont Cenis tunnel and Verona controls the Brenner route to Austria.

Across the Apennines there are several lines joining the two main through routes which follow the coastal plains throughout the length of Italy.

The Italian rivers are so rapid as to be of little use for navigation though they provide a valuable source of power. The canals are chiefly in the lowland of the north and are of some local importance.

Rome, on the Tiber, is the capital (see p. 222), but its importance is now due mainly to its historical associations and to its attraction for tourists. *Naples*, on the west coast, is the chief port of Italy and has a broad, fertile plain as its hinterland. It exports fruit and wine and imports coal, while it manufactures marine engines and macaroni. Like Rome, it is an important tourist centre.

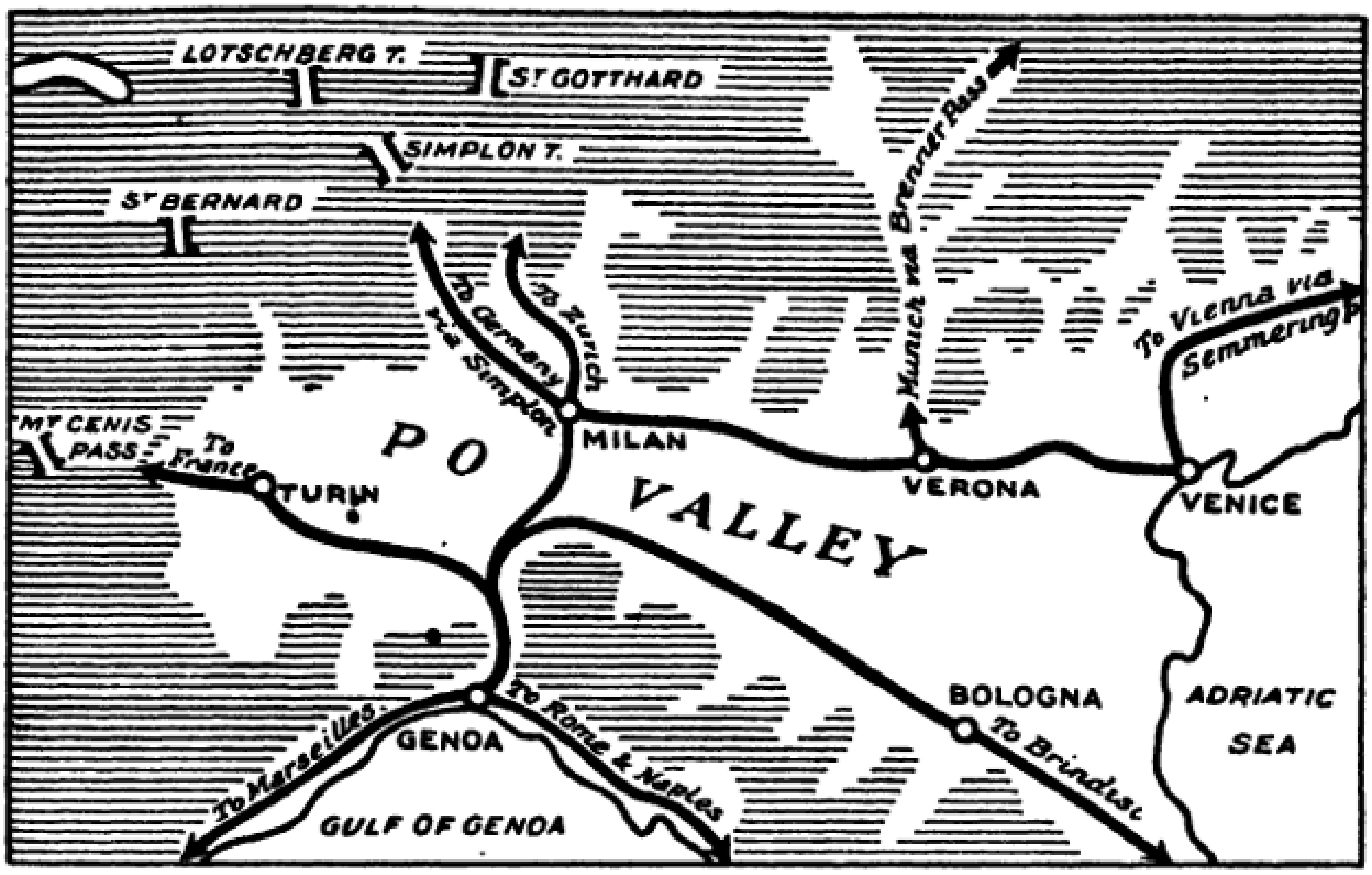


FIG. 163: ROUTES OF NORTHERN ITALY AND THE ALPS.
(Hig[illegible] shaded)

Florence, on the river Arno, makes straw hats, has iron-smelting works and is a route centre. *Brindisi*, near the southern end of the Adriatic coast, is a port for mails and passengers crossing overland from N.W. Europe en route for the East.

Milan is an important railway centre and manufactures silk, cotton goods and railway rolling stock. *Genoa* is the western outlet for the products of the Plain of Lombardy and has shipbuilding and cotton industries. The low Bochetta Pass leads from Genoa to the Po valley and northern Europe. *Turin* is at the head of navigation of the Po and manufactures cotton, railway material, leather goods and motor cars. It is an Alpine route centre, being, in particular, at the Italian end of the Mont Cenis Tunnel route into France.

Venice, at the head of the Gulf of Venice, is built on islands. At one time it was a port of great trading importance, but the gradual silting up of the Adriatic Sea, and the fact that Venice is not favourably situated either for industrial development or from the standpoint of modern commerce, caused it to decline in importance. At the present time it is famed as a centre for tourists, to whom its inhabitants sell a large part of the articles of luxury and ornament which they manufacture in great quantities.

Trieste and *Fiume*, at the head of the Adriatic, are Italian ports which act mainly as the outlets for the Danubian States. *Leghorn*, in the north-west of the peninsula, is a port with glass and straw hat works, and is also the iron-smelting centre for the ores of Elba. *Palermo*, the chief port of Sicily, is important for the production of olive oil and also smelts ores.

Commerce of Italy

Italy's principal *exports* are silk and other textiles, fruit, luxury goods, vehicles and cheese.

The *imports* comprise cereals, cotton, wool, iron and steel, machinery, minerals, wood, skins and furs.

The countries with which trade is mainly carried on are the United States, Germany, Great Britain, France and Argentina.

THE IBERIAN PENINSULA

Area : Spain 196,607 sq. miles ; Portugal 35,490 sq. miles.

Population : Spain 24,000,000 ; Portugal 7,000,000.

The Iberian peninsula consists of the countries of *Spain* and *Portugal*, the latter of which occupies a comparatively small part of the western seaboard. Except for a neck of land in the north-east across which run the Pyrenees, separating Spain from France, the peninsula is surrounded by sea—the Atlantic Ocean to the north and west and the Mediterranean Sea to the south and east. The *Azores* Islands are politically part of Portugal.

Relief and Climate

The peninsula consists of a huge central plateau known as the *Meseta*, which rises in the north to the *Pyrenees* and the *Cantabrians*, and, in the south, to the *Sierra Morena* and the *Sierra Nevada*. Around the coast is a narrow plain, widening out in parts to more extensive lowland areas, chiefly in the river valleys, notably those of the *Douro* and the *Tagus* in Portugal, and of the *Guadalquivir* and the *Ebro* in Spain. The Tagus is noted for its fine estuary. The Guadalquivir flows through the fertile valley of Andalusia, and the Ebro is the only important river flowing to the Mediterranean.

The climate varies owing to differences in relief and latitude. Broadly, the west coast margin (mainly because of the influence of the Westerly Winds) has an equable climate with rain all the year, but chiefly in the autumn and winter. The Meseta, owing to its elevation and its distance from the sea, has a low rainfall and a more extreme type of climate. The south and south-east of Spain have a Mediterranean type of climate and are subject to the *solana*, a hot, dry, dust-laden wind from the Sahara. Further details of the climatic variations will be found below under the section on Natural Regions.

Industries

AGRICULTURE. The peninsula has an extremely varied vegetation, and agricultural pursuits are most important. Much of the soil, however, is infertile, and there is a scarcity of water, particularly on the Meseta. Some irrigation is practised but might be more profitably developed. The vine is cultivated in nearly every part of the peninsula, and the sub-tropical south and south-east are important for fruit (olives, oranges, lemons and bananas in particular) and sugar-beet (Granada and Almeria). Wheat, the principal cereal, and barley are grown in the wetter parts of the Meseta and in the Mediterranean region. Maize, which can be grown in most parts, is more important in the wetter and more sheltered north-west. Silkworms for silk production are reared along the east coast, and esparto grass (for paper-making) on the sandy plains. Cork-oak is an important product, particularly in Portugal, while the forests of the north give rise to an important export trade in pit-props.

Large flocks of sheep are reared on the Meseta, as well as smaller numbers of cattle and pigs. The north-west and Mediterranean coasts support a *fishing* industry, the principal catches being of sardines, tunny fish and cod. These support an important industry devoted to the preparation and canning of fish, much of which is exported.

MINING. Minerals are abundant in Spain but they are by no means fully exploited. There are large deposits of iron ore, mainly in the Santander, Vizcaya, Leon and Oviedo Provinces in the north; in Huelva Province on the slope of the Sierra Morena; and in Almeria and Murcia in the Sierra Nevada. Silver and lead are mined in the Sierra Nevada and in the Sierra Morena (at Cordoba). Copper also is important, the principal centre being the Rio Tinto mines of southern Spain. The principal coal-mining centre is in the Oviedo Province in the north, whence coal is shipped from Gijon to other parts of the country. Coal is found also in Catalonia, Valencia and Cordoba, but the quality is poor.

Mercury is found in abundance, the chief centre being at Almadén in south-west New Castile, while zinc is obtained from Granada and Santander. There are rich deposits of rock salt in Catalonia and salt is also obtained by evaporation of sea-water at Setubal, in Portugal, south of Lisbon. At Fundão, south of the Douro in Portugal, are the largest deposits of wolfram in Europe.

MANUFACTURES. (The development of manufactures has been particularly slow both in Spain and in Portugal.) The preparation of wine and the preservation of fruits are important industries, the principal wine centres being Barcelona, Tarragona, Jerez near Cadiz (sherry) and the Douro valley, famous for its port wine. Cotton goods, woollen goods, paper and glass are made in Spain; while cottons, woollens, silks, and linen are manufactured in Portugal, which has also a porcelain-tile industry.

Natural Regions of Iberia

The division of Iberia into natural regions is best made on a relief and climatic basis as follows: (1) the Cantabrian and North-West Coast Region; (2) Portugal; (3) the Meseta; (4) South-West Spain; (5) the Coastal Region of the Mediterranean; (6) the Ebro Basin and (7) the Spanish Pyrenees.

THE CANTABRIAN AND NORTH-WEST COAST REGION has a maritime climate with a heavy rainfall. It is economically the most important region of Spain, with forests of pine and cork-oak on the mountains; rich pastures on which dairy cattle are reared; agricultural products, such as the vine, olives, sugar-beet and maize; and a fishing industry, the chief catch being sardines. In addition, it is an important mineral-producing region, with a large output of coal and iron, whilst other minerals, such as zinc and tin, also are found.

Oviedo is the coal centre and *Santander* and *Bilbao* the ports, shipping large quantities of iron ore to other countries and especially to South Wales.

PORTUGAL occupies the remainder of the western coastal part of Iberia. The climate is oceanic, but towards the south it becomes sub-tropical as a result of lower latitude. Nearly 50 per cent. of the area is unproductive. In the productive parts primitive methods are employed whilst the people are generally lazy and without initiative. As a result the country is very backward and the means of transport are poor. Of the productive area a large proportion is covered with cork-oak, from which quantities of cork are obtained for export. The acorns of the forests support large numbers of pigs; the hills are sheep-rearing regions and cattle are reared in the lowlands.

Wheat, maize, rye and Mediterranean fruits (such as the vine, the olive, oranges, lemons and figs) are cultivated. The most important fruits are grapes, giving rise to a large wine industry, and olives. The coastal fisheries provide sardines.

The backwardness of the country is clearly shown by the almost total lack of development of the mineral resources, of which there is an abundance, mainly of iron, copper, tin, salt and wolfram. The absence of coal explains to a large extent this lack of development.

Lisbon, situated on the wide Tagus estuary, has a good harbour and is the capital of Portugal. It exports fruit and cork, and imports a variety of produce from the Portuguese African colonies. It has iron works, shipbuilding yards and cotton factories. *Oporto*, on the Douro, with its outport *Leixolo*, is the principal outlet for the Portuguese wine trade, and gives its name to the world-famed wine known as "port." It has also textile manufactures.

THE MESETA has a continental type of climate with a low rainfall, due to its elevation and distance from the sea. It is a plateau region bordered in the south by the Sierra Morena, which has deposits of coal, mercury, lead and copper. The only other mineral is iron, found in the north near Leon. Extensive areas of the Meseta are valueless as a result of low rainfall and poor soil, but elsewhere, particularly in the river valleys, wheat, rye, barley and the vine are grown, irrigation being frequently employed. In the poorer parts large flocks of Merino sheep are reared.

Madrid, the capital of Spain on the Manzanares River, is, by virtue of its central position on the Meseta, highly important as a route centre. It has carpet, tobacco and iron industries. *Valladolid*, to the north-west of Madrid on the Pisuerga, a tributary of the Douro, is a large route and trading centre, with a wheat-milling industry.

Rio Tinto, at the foot of the Sierra Morena in the south-east, is the Spanish copper-mining centre, having its outlet in *Huelva* on the Gulf of Cadiz in the south. *Almaden*, to the north of the Sierra Morena, is the centre of the mercury industries and textile factories of this region.

SOUTH-WEST SPAIN. This region corresponds broadly with the Guadalquivir valley. It has a mild, sub-tropical climate mainly because of its latitude, and is fertile and well-watered, although in parts irrigation is necessary. It produces Mediterranean fruits, such as oranges, lemons and grapes from the vine (for sherry and raisins), cereals, sugar-cane, sugar-beet, tobacco and silk.

Seville, in the centre of the Guadalquivir valley, is the chief town and port of this region, and is noted for oranges. As a commercial port, it has largely superseded *Cadiz*, which stands on the coast south of the Guadalquivir estuary. *Jerez*, to the north-east of Cadiz, is famous for its sherry, to which it gives its name.

THE MEDITERRANEAN COASTAL REGION suffers from a low rainfall as it is in the rainshadow of the plateau. Irrigation is therefore extensively practised and with the abundant sunshine results in the production of the Mediterranean fruits for which this region is famous. The slopes are extensively terraced, and the irrigated lands are called "huertas." The fruits include grapes, oranges, lemons, olives, almonds and pomegranates, whilst the mulberry also is grown for the rearing of silkworms.

Barcelona, situated on the narrow Mediterranean coastal plain in the north-east of Spain, is the chief seaport, and has cotton and linen manufactures. It is the main outlet for the Ebro Basin though situated at some distance from the mouth of the river.

Valencia, also on the east Mediterranean coast, is the capital of the State of that name and important for its silk industry and fruit exports. *Malaga*, on the south-east coastal plain, exports olive oil, wine and sugar-beet. *Almeria*, east of Malaga, and *Alicante*, south of Valencia, also share in the fruit trade. *Cartagena*, in the south-east, exports silver and lead as well as fruit. *Murcia*, on the Segura River, to the north of Cartagena, is a prominent inland centre of the fruit growing region and the capital town of the State of the same name.

THE EBRO BASIN is a lowland area drained by the river Ebro. It is almost surrounded by highland, having only a narrow opening to the Mediterranean Sea. The enclosing mountains give the region a low rainfall and also a more extreme climate than the eastern coastal areas. Irrigation is employed and with its aid cereals and fruits, such as grapes and olives, are grown. The leading centre is *Zarogoza*, or Saragossa, which is a bridge town and has miscellaneous industries. *Barcelona* acts as the main outlet of this region.

THE SPANISH PYRENEES are important only from a political standpoint in that they act as a barrier between Spain and France. They naturally belong to the same natural region as the French Pyrenees.

Communications

Communication between different parts of Spain and Portugal is difficult owing to the relief of the peninsula. The mountain ranges act as barriers between the coast and the interior, while the rivers flow rapidly through deep gorges. The *Tagus* is navigable to some extent and forms a route from the west coast inland, while the *Douro*, *Ebro*, *Guadiana* and *Guadalquivir* are navigable for short distances from their mouths.

As the bulk of the population is centred in the narrow coastal plains, coastal services are important, but the principal means of communication are the railways, which radiate from Madrid. The most important lines run (1) northwards *via* Avila (*a*) to Oporto and (*b*) to Valladolid, Biarritz and the west coast of France ; (ii) west down the Tagus valley to Lisbon, with a branch north to Oporto ; (iii) south to the Guadalquivir valley, with branches to Cordoba and Cadiz and to Malaga and Gibraltar ; (iv) east (*a*) to Murcia, Cartagena and Valencia, and then northwards along the coast to Barcelona ; and (*b*) to Saragossa and the Ebro valley.

Commerce of Spain and Portugal

Spain *exports* wine, olive oil, fruits, metals, minerals, fish, cork, esparto grass, stone, animals and wool. The *imports* include wheat, flour, coal, raw cotton, sugar, timber, chemicals, machinery, vehicles and ships.

Of the total Portuguese *exports*, 50 per cent. consist of wine and fish, other items being cork, cotton goods, fruits, and vegetable oils. She *imports* foodstuffs (such as wheat, rice and sugar), textiles, coal, iron and steel, fish, petroleum and motor-cars.

The principal trading countries are Great Britain, France and the United States.

GIBRALTAR

Gibraltar is a small British Crown Colony on a rocky promontory which juts out from Spain at the entrance to the Mediterranean Sea.

It consists of a bare rock three miles long, three-quarters of a mile wide and about one-quarter of a mile high. Since its capture in 1704 it has been of the greatest importance as a base from which the British navy has controlled the most important Empire trade route—the Suez route to India. It lies near the narrowest part of the strait and is very strongly fortified.

Apart from its value as a naval base, it is highly important as a coaling, oiling, cable and wireless station. It has a good harbour, which is used by ships of all nations, and has a typical Mediterranean climate. The bulk of its supplies of bunker coal and oil come from Britain.

MALTA

Malta is the most important of a small group of islands lying between Sicily and Africa. It has an area of 92 sq. miles and forms, with *Gozo* (the only other inhabited island of the group), a British Crown Colony. It is the base of the British Mediterranean fleet, is an important coaling, oiling, cable and wireless station, and will probably become of great importance as a landing and fuelling station on Empire air routes.

The climate is of the Mediterranean type, and cereals, fruits and potatoes are produced, but not in sufficient quantities for local needs. The island is subject to a strong local wind from the north-east, known as the *Gregale*, and in many districts the fields have to be walled to protect the crops from its effects. *Valetta*, the capital and chief port, has two magnificent harbours (one on the north and one on the south coast), and is an important entrepôt. Coal is imported from Great Britain for the replenishment of supplies for bunkering.

QUESTIONS ON CHAPTER 23

1. Draw sketch-maps to show the importance of the position of *four* of the following towns:—Strasbourg, Frankfurt-on-Main, Vienna, Danzig, Amsterdam, Moscow, Basle, Constantinople. (*C.I.S. Prelim., Dec.,* 1930)
2. Name, locate and show the importance of the chief Alpine passes which are in or lead directly into Northern Italy. (*I.S.A. Prelim., Dec.,* 1930)
3. What geographical factors have aided, and what hindered, the economic development of Spain? In your answer give some indication of the main occupations of that country. (*I. of B., Qual.,* 1931)
4. Give an account of the silk industry in Italy and explain its development in a country with no appreciable coal resources. (*I. of B., Qual.,* 1926)
5. Draw a sketch-map of the Iberian peninsula showing the principal mountain chains, rivers, capes and bays. (*I.C.W.A. Prelim., June,* 1931)

6. On a map of Europe mark and name the Carpathians and the Apennines, name the Volga and the Elbe, Sardinia and the Skagerrak. Show, without boundaries, the position of Czechoslovakia, Finland, and Portugal. Mark and name Berlin, Budapest and Moscow. Show a main railway route from London to Constantinople. (*C.S., Nov.,* 1927)

7. On a map of Europe, mark and name Paris, Rome, Hamburg, Danzig, Constantinople, Astrakhan, Stockholm. Also name the White Sea, Adriatic Sea, the Sound, Cyprus, Volga, Danube, Ebro, and (without boundaries) Finland, Switzerland, Czechoslovakia. Shade ONE large area for each of the following :—(*a*) coniferous forests, (*b*) wheat cultivation, (*c*) grassland. Write the words forest, wheat, grass on the shaded areas in order to distinguish the three kinds of land. (*C.S., May,* 1929)

8. *EITHER,* Note, and account for, any exceptions to the general rule that the uplands of Continental Europe (above 1,000 feet) support only a sparse population.

OR Contrast the Prussian Plain with the Iberian Plateau in as many ways as you can. (*L.M., June,* 1929)

9. Give an account of the leading imports and exports of the Alpine Region of Europe, pointing out any ways in which (*a*) the mountainous character of the country, and (*b*) its inland situation, have influenced the character of its trade. (*L.M., Jan.,* 1930)

10. Show graphically (*e.g.,* by one or more of such methods as sketch-maps, sketches, sections or diagrams) the most typical features of the shore-lines of (*a*) West Norway, (*b*) the Baltic Sea, and (*c*) the Mediterranean Sea, respectively. Add explanatory notes if necessary. (*L.M., Jan.,* 1930)

11. *EITHER,* Contrast the density and distribution of population in Holland and Switzerland, and account for the facts you mention.

OR Compare and contrast the character of the trade of the East Baltic and Black Sea ports respectively. (*L.M., Jan.,* 1923)

12. Draw careful sketch-maps to show the position and importance of (*a*) the St. Gotthard Pass, (*b*) the mouth of the Elbe, (*c*) the Moravian Gate, (*d*) the Gulf of Finland. (*L.M., June,* 1925)

13. Set out as many facts as you can to show the effect of mountains on the lives and occupations of the people of Switzerland and Sweden. (*C.S., Oct.,* 1927)

14. Discuss the distribution of the following crops in Europe, and relate the distribution to the geographical causes :—rye, grapes, flax, maize. (*L.M., June,* 1926)

15. Describe the distribution of population in Rumania. Account as fully as you can for the facts you describe. (*L.M., Jan.,* 1931)

16. Compare or contrast briefly the geography of France and Italy. (*I. of B., Pt. I,* 1932)

17. Divide Russia (in Europe) into natural regions, and describe briefly the climate, chief occupations of the people, and the natural products of each region. (*I.S.A. Prelim., June,* 1929)

18. What is a hinterland? Show by a sketch-map the hinterland of Genoa and give some account of the trade of the port. (*L.M., June,* 1933)

CHAPTER 24

THE BRITISH ISLES

THE BRITISH ISLES is a geographical unit consisting of England, Wales, Scotland, Ireland and numerous adjacent small islands. The term "*Great Britain*" includes England, Wales and Scotland, but not Ireland.

IRELAND is divided politically into (*a*) *Northern Ireland*, which has its own Parliament but is otherwise directly under the British Crown, and (*b*) the *Irish Free State*, which is a self-governing Dominion within the British Commonwealth of Nations.

The term "*United Kingdom*" includes Great Britain and Northern Ireland, but not the Irish Free State.

The areas and populations of the constituent countries are shown in the Table below. The population figures are those of the last census—1931 for Great Britain, and 1926 for Ireland. The population of England and Wales is now over 40 million.

British Isles : Area and Population

	AREA (*sq. miles*)	POPULATION
England	50,874	39,947,931
Wales	7,466	
Scotland	30,405	4,842,554
Isle of Man ...	221	60,284
Channel Islands ...	75	90,230
Northern Ireland ...	5,457	1,256,561
Irish Free State ...	27,129	2,971,992
Totals ...	121,627	49,169,552

Position

The British Isles are situated in the north temperate zone on the western margin of the great land mass of Eurasia. To the south the continent of Africa extends well beyond the Equator, and to the west, across the Atlantic Ocean, lie the continents of North and South America. As can be seen by reference to an atlas, the islands lie in the centre of the great land masses of the world and have direct connection with all the great oceans. This favourable world position has been of the utmost significance in our national development, while the situation with regard to Europe has also been of great importance. In the first place, marginal position gives the British Isles a climatic advantage, for they have a much more equable climate than other European countries which lie within the same latitudes but farther east and farther from the sea. Secondly, the vast development of American trade has caused the greater part of world commerce to be centred in the North Atlantic, and the British Isles, lying between the great commercial and industrial regions of Europe and the Americas, are placed at the very centre of the world's economic activities.

Surrounding Seas

The adjacent seas have contributed largely to the prestige and pre-eminence of Britain for, in addition to the fact that their

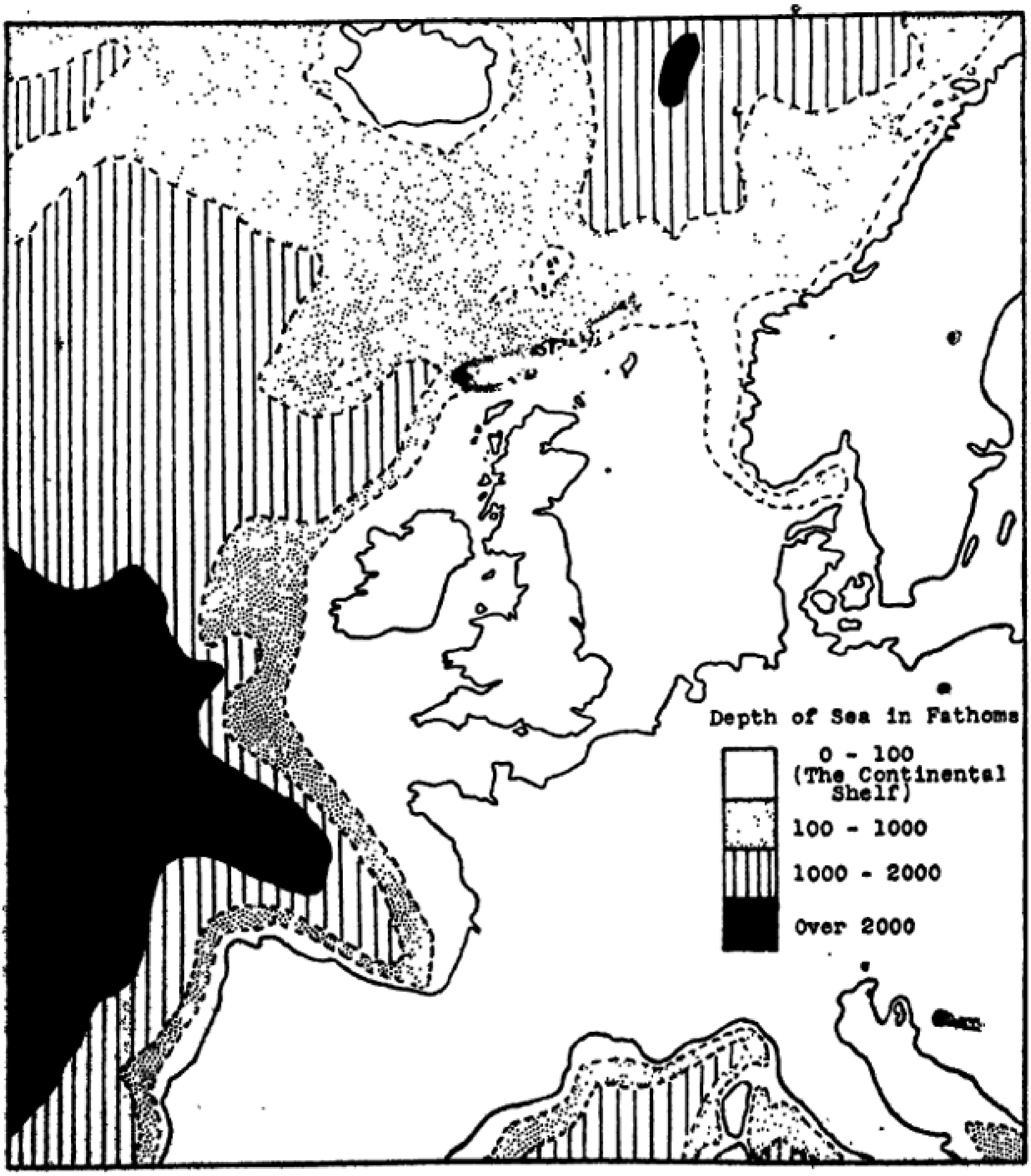


Fig. 164 : The Continental Shelf of Europe.

moderating influence on the climate has conduced to the development of an active and energetic people, and so encouraged the rise of a hardy, seafaring and exploring race, they are important highways of commerce and valuable fishing grounds.

The insular position of Britain, too, has been of further benefit. While the narrow seas have protected her in the past from invasion and from the spread of infectious diseases from the mainland, they have not acted as a barrier to beneficial influences. On the contrary, they have facilitated intercourse with people of earlier and more advanced culture; they have allowed the British people to learn much from their neighbours without becoming unduly involved in their disputes, and have permitted a degree of undisturbed internal progress such as no other European country has been able to enjoy.

A further great advantage to the British Isles is their position, in shallow seas, on the European "*continental shelf*"—a submerged platform extending north-west from the Continent (Fig. 164). These comparatively shallow waters have not only provided valuable fishing grounds (as the sunlight which reaches the sea floor promotes the growth of marine vegetation), but have also conferred on these islands the benefit of high tides which are of such great utility in flooding the harbours, in keeping them free from silt and waste, and in carrying ships far up the estuaries into the heart of the industrial areas.

The Tides of the British S[illegible]

The great Atlantic tidal wave which reaches the British Isles from the west divides into two parts when it meets Ireland. One branch travels round the north of Scotland, after sending an off-shoot into the Irish Sea, and gives rise to a wave which passes from north to south down the eastern coast of Great Britain.

The southern part of the wave from the Atlantic is divided by the Cornish peninsula into two parts. One part goes up the Bristol Channel and the Irish Sea, and at Liverpool meets the branch which enters the Irish Sea from the north. The other part passes up the English Channel and reaches Dover at about the same time as the other reaches Liverpool. The tides can enter the channel between the Isle of Wight and the mainland at both ends. This is an important geographical feature, because it largely contributes to the four high tides a day experienced in Southampton Water—a factor which has been of great commercial advantage to the port of Southampton.

Meanwhile, the wave which rounds the north of Scotland and passes down the eastern coast of Great Britain takes about 12 hours to reach the mouth of the River Thames. Its arrival at that point approximately coincides with the arrival of the high tide from the English Channel and, consequently, the inlets and harbours of that neighbourhood get strong tides which assist in keeping them free from silt.

In the open ocean there is nothing to interfere with the uplift of the water and the difference between high and low tide is only a few feet. When the tidal wave enters a shallow sea, however, the front of the wave is retarded, the waters are piled up and the height of the wave increases. This is what happens in the shallow British seas, with the result that markedly high tides are experienced around the islands, the difference between high and low water amounting in many parts to 30 feet or more. When the tidal wave enters a channel or gulf which not only shallows but also becomes narrower, the tidal effect is even more marked. This happens, for example, in the Thames estuary and in the Bristol Channel. In the latter the difference between high and low water during spring tides is as much as 42 feet.

PHYSICAL FEATURES

In general shape or outline, the British Islands are very irregular, especially on the west, and the coastline is consequently very long in comparison with the area. Moreover, as a result of the indented nature of the coast, no place in the Islands is more than 70 miles from navigable water or more than 100 miles from the sea, a factor which has important beneficial effects on both commerce and climate. As ships can penetrate far inland, the necessity for rail or road transport is minimised and the cost of transport is greatly reduced, particularly in the case of goods of a bulky nature. Also the indentations in the coastline not only provide many excellent harbours but enable the tempering influence of the sea to penetrate far inland and to reach every part of the islands. It is not surprising, therefore, that Britons have responded to the natural advantages of their island home and become a race of seamen, and that the mercantile marine of what is only a comparatively small country should have grown to be the largest and most efficient in the world.

The surface of the British Isles is unmarked by any really high mountains, and in few parts does it rise above 2,000 feet. Such high land as exists is mainly in the north and west, so that a line drawn on a physical map from Exeter, at the mouth of the River Exe, to the River Tees, in the North Riding of Yorkshire, divides the country into two regions of very different physical structure. North and west of the line the land is mainly hilly and comparatively barren; south and east of it the land is low-lying and fertile. These conditions have made the south-east mainly agricultural, and account for the fact that, before the Industrial Revolution, the south-east was much more densely populated than the north and west.

The chief surface features of the British Isles may conveniently be dealt with under the following headings: (*a*) the *Surface Features of Scotland, viz.*, the Highlands, the Lowlands and the Southern Uplands: (*b*) the *Surface Features of England and Wales, viz.*, the Pennines, the

Cumbrian Hills, the Welsh Uplands, the Highlands of Devon and Cornwall and the English Plain and (*c*) *the Surface Features of Ireland*, *viz.*, the Central Plain and the Coastal Mountains.

The Surface Features of Scotland

THE HIGHLANDS, massed in two main groups, extend southwards as far as a line which connects the mouth of the Clyde on the west with Stonehaven on the east, and along which there is a sudden change of rock, due to a fault in the earth's surface. Throughout the Highlands the surface is very uneven, and while many mountain peaks rise above the general level of the country, there are many very deep valleys known as "glens". This region is the wildest and most desolate part of the British Isles.

The Highlands offer a steep front to the Atlantic and a long, gentle slope to the east. They are divided into two parts by the very narrow but deep rift valley of *Glenmore*, which runs from south-west to north-east and contains three long, narrow lakes, of which the largest is *Loch Ness*. The lakes have been connected to form the *Caledonian Canal*, which provides a passage for small vessels from the North Sea to the Atlantic. To the north of Glenmore are the *Northern Highlands* and to the south the *Grampian Highlands*, which drop to the *Lowlands* along the fault-line in the rocks to the south, almost parallel to Glenmore.

The west coast of the Highlands is high and rugged and much broken by long, deep inlets, enclosed by high mountain walls, similar in character to the fjords of Norway. Off this coast are the *Inner Hebrides*, a group of islands, of which the chief are *Mull* and *Skye*, whose beauty attracts many tourists. Of the *Outer Hebrides*, which, as their name implies, lie beyond the inner fringe of islands, the largest is *Lewis-Harris*. Off the north-east coast lie the *Orkneys* and the *Shetlands*, two groups containing numerous islands of varying sizes. The coastal plain to the east of the Highlands is in parts wide and fertile.

THE LOWLANDS comprise a rift valley which was formed by deep faults in the rocks between the Grampians and the Southern Uplands. As they are rich in mineral wealth and extremely fertile, they support four-fifths of the total population of Scotland and are by far the most important region of the whole country. Most of the area is low-lying, but there is a broken line of hills in the north, running from the west of Glasgow to the east coast near Montrose, while along the southern boundary are other uplands.

Between the northern line of hills and the Grampian Highlands lies *Strathmore* (*i.e.*, the *Great Valley*), an area of great fertility and rugged beauty. The valley is widest in the east, to the north of the *Ochil Hills* and the *Sidlaw Hills*, and has an important extension, the beautiful *Carse* (*i.e.*, garden) *of Gowrie*, along the northern bank of the estuary of the Tay. Sheltered on the north by the Sidlaws, the Carse of Gowrie grows large quantities of fruit for the Dundee jam factories. The Lowlands are well watered by the rivers *Ayr*, *Clyde*, *Forth* and *Tay*, the three last having fine navigable estuaries.

THE SOUTHERN UPLANDS occupy most of southern Scotland. They are not as lofty as the Highlands and consist of gently rounded hills covered mainly with heather, bracken and coarse grass. They present an unbroken front to England and render access to Scotland difficult except by way of the narrow coastal plains and river valleys. The most important part is the fertile and industrial valley of the *River Tweed*, which separates the *Lowther Hills* on the north from the *Cheviots* on the south.

The Surface Features of England and Wales

THE PENNINES, a belt of mountainous moorland running north and south, form the backbone and watershed of northern England. On the north these hills are separated from the *Cheviot Hills* by the valley of the *South Tyne*, the break in the hills being known as the *Tyne Gap*. On the west the range is connected with the *Cumbrian Hills* by a ridge of land about 1,000 feet in height, called *Shap Fell*. Elsewhere the two groups are separated by the valley of the *Eden*, extending to the north, and by that of the *Lune*, which extends to the south.

Farther south, the Pennines are almost cut in two by the valley of the River *Aire*, the partial divide being known as the *Aire Gap*, whence they continue southwards until they terminate in the *Peak District* of Derbyshire.

THE CUMBRIAN HILLS lie in the north-west of England to the west of the Pennines. Once a great dome of rock, the region has been broken up into a mass of hills separated by deep valleys containing many beautiful lakes. This is the *Lake District*, so well loved by tourists and mountain climbers.

THE WELSH UPLANDS are separated from the Pennines by a belt of lowland across which flow the *Dee* and the *Weaver*. The hills, which are in many places higher than any parts of England, extend with little interruption, save that of the long river valleys, from the north of Wales almost to the south and from the west to the east. They leave only a narrow coastal plain which broadens out somewhat in the south along the Bristol Channel and in the north as the Isle of Anglesey.

THE HIGHLANDS OF DEVON AND CORNWALL can be divided into three groups: *Dartmoor* in South Devon; *Exmoor* in North Devon and Somerset; and the *Cornish Heights*. These are nowhere higher than about 2,000 feet and rise much more gently than the hills of Wales and Cumberland.

The English Plain occupies practically the whole of the rest of England, and only in a few parts does the land exceed 1,200 feet, although there are numerous minor uplands. A ridge of limestone, with its steep face (or scarp) towards the west and north-west and its gentle slope to the south and east, runs in a curved line from the mouth of the *Exe* to the mouth of the *Tees*. Its outstanding constituents are, from the south-west to the north-east, the *Blackdown Hills*, the *Cotswold Hills*, *Edge Hill*, the *Northampton Heights* and the *North York* (or *Cleveland*) *Moors*.

Roughly parallel with this line of limestone hill runs a similar series of chalk hills on the south, beginning in Dorset and ending at *Flamborough Head* in Yorkshire. From south-west to north-east these hills comprise the *Dorset Downs*, the *Marlborough Downs* (sometimes called the *White Horse Downs*), the *Chiltern Hills*, the *East Anglian Heights*, the *Lincolnshire Wolds* and the *Yorkshire Wolds*. Between these two lines of hills is a fertile clay plain which is an important agricultural and pastoral region.

From the *Plain of the Midlands* run two branches, one forming the *Cheshire Plain* and the other the *Plain of York*. On the east of the Pennines, the plain is broader and is crossed by the several rivers forming the *Yorkshire Ouse*, which, with the *Trent*, flows into the *Humber*. On the western side there is a similar plain crossed by the rivers *Ribble*, *Mersey* and *Weaver*. Both these plains provide natural routes to Scotland, and by virtue of this fact and their natural fertility, have always been important.

In the south-east of England there are two other chalk ridges. The first of these, known as the *North Downs*, runs westward from the coast at Dover in a gently curving line with its convex side to the north until it merges in the Marlborough Downs. The other ridge runs from this junction on the west to the coast at Beachy Head on the east, and is known as the *South Downs*. Through these hills the rivers have cut many gaps which are used by the railways to the south coast (see Fig. 169 in Chapter 25).

The Surface Features of Ireland

The mountains of Ireland lie in scattered groups round the *Central Plain* which is the chief feature of the country. They are of little economic value, as they are deficient in mineral wealth and their soil is thin and poor. Most of the Central Plain is composed of limestone, overlain to a considerable extent by deposits of clay, which, being impervious to water, cause it to collect in the hollows, forming lakes and bogs.

The position of the mountains causes the rivers to flow across the plain, which has, in consequence, marked facilities as regards inland water transport—an advantage which would be of much greater value if the country were more industrialised. Owing to the proximity of the mountains to the sea, the coastline is very indented and there are a number of wonderful natural harbours, such as those of Belfast, Cork, Waterford and Wexford.

River System of the British Isles

In Great Britain the main water-parting lies towards the west and thus, with a few exceptions such as the rivers Clyde, Mersey and Severn, the rivers flowing west are shorter and more rapid than those flowing to the east.

In Scotland, the water-parting commences at Duncansby Head, runs west and then south, nearly bisects the Glenmore valley, and continues south between Lochs Lomond and Katrine. The only river of importance flowing westwards from this water-parting is the Clyde. From the headwaters of this river a minor watershed, running south-east, separates the short Ayrshire rivers from those flowing south to the Solway Firth, *e.g.*, the Annan, Dee and Nith. From the eastern side of the main Scottish water-parting numerous rivers, separated by small east-west divides, run east into the North Sea. Of these rivers, the most important are the Tay, Spey, Tweed, Dee and Forth.

The main English water-parting runs along the Pennine Range, from which several important rivers flow eastwards into the North Sea, such as the Tyne, Wear and Tees and the rivers which unite to form the Humber estuary, viz., the Derwent, Ouse, Wharfe and the Aire-Calder system, which all unite at the head of the estuary, and the river Trent, which, coming from the south, enters the estuary some miles nearer the sea. The chief rivers flowing west from the Pennine divide are the Eden, Lune, Ribble and Mersey.

South of the Trent, the English water-parting is continued along the uplands of the Midlands (Cannock Chase, Clent Hills, Edge Hills) to the Cotswolds, south of which the minor southern watershed runs west to Land's End and east to the South Foreland. From the uplands of Central England the rivers Witham, Welland, Nen and Great Ouse flow east to the Wash, whilst several smaller rivers (such as the Yare and Stour), and the important River Thames, which rises from the water-parting of the Cotswolds, all flow east to the North Sea. The chief rivers flowing to the English Channel from the southern divide are, from east to west, the Itchen, Wiltshire Avon, Stour, Exe, Tamar and Fal, whilst those on the south of this water-parting include the Kennet (a tributary of the Thames), Bristol Avon, Parret, Taw and Torridge.

The Welsh water-parting, or Welsh Divide, also lies comparatively near the west coast so that there are no important rivers flowing into Cardigan Bay. In the north-east, the water-parting turns sharply east, separating the Dee, which flows north, from the Severn. The remaining rivers of the eastern side of the parting include the Severn (the most important) Wye, Usk, Taff, Neath and Towy, all of which have a general southerly trend to the Severn estuary and the Bristol Channel.

THE THAMES is the most important river of the British Isles although not the longest. Its four head-streams, the Thames or Isis, Churn, Colne and Leach, rise on the south-east slope of the Cotswolds. The main stream flows east to Oxford and then turns south, flowing through the narrow Goring Gap between the Chilterns and the Marlborough Downs. From Reading, which lies east of the gap, the Thames follows a winding easterly course through Maidenhead, Windsor, Kingston, London, Greenwich, Woolwich and Gravesend, below which it expands into a wide estuary and enters the North Sea.

THE SEVERN rises at a height of 1,500 feet above sea-level from a spring on the eastern side of Plinlimmon, in Montgomeryshire. After leaving the mountains the river flows east to Llanidloes and then north-east through Newtown and Welshpool to the Welsh boundary, where it turns east to Shrewsbury and continues south through a narrow valley in the Shropshire Hills. Its valley widens out and the river passes through Worcester to Gloucester, where the valley is again confined between the Cotswolds and the Forest of Dean. A few miles south of Gloucester, the river begins to broaden out into a wide, long estuary which leads into the Bristol Channel.

THE CLYDE, the most important river of Scotland, rises in the Lead-hills in Lanarkshire and flows in a north-westerly direction through narrow glens, or valleys, into the wooded lowland valley guarded by Lanark. Shortly before reaching the valley, the river descends from 560 to 200 feet in four miles, forming the celebrated *Falls of Clyde.* After leaving Lanark the river continues north-east and flows through the well-known industrial area of "the Clyde," passing through Hamilton, Glasgow and Renfrew to its estuary, which is the only important opening on the west coast of Scotland.

THE SHANNON, the leading river of Ireland and the longest in the British Isles, rises in the Cuileagh Mountains of County Cavan and flows south-west to Lough Allen in Leitrim. It continues south through a succession of expansions known as "loughs" (lakes), of which the most important are Loughs Boderg, Bofin, Forbes, Ree and Derg, and having passed through the towns of Carrick and Athlone, it flows in a narrow valley between the Silvermine Mountains and Slieve Bernagh to Limerick. The river now turns westwards and opens into the Atlantic in a wide estuary between Loop Head and Kerry Head.

CLIMATE

Temperature

As the British Isles lie between latitudes 50° and 60°N., they are within the region of the Westerly, or Anti-Trade, winds. These winds blow almost all the year round from the west and south-west over the North Atlantic Ocean. In it the *Gulf Stream*, a mighty current of relatively warm water, flows from the warm south-west towards the north-east, and from this the Westerlies, themselves warm and moist through contact with it, drive a great volume of water—the *North Atlantic Drift*—over the north-eastern part of the Atlantic where it spreads out as a relatively warm surface-layer.

An examination of a temperature map (Fig. 68) will show that, as a result of these factors and oceanic influences generally, the British Isles are enveloped in a gulf of warmth in the winter, and that they are kept practically ice free when other lands in the same latitudes (*e.g.*, Labrador and Central Russia) are icebound. At this season the air over these islands is as much as 30°F. above the mean temperature of other areas in the same latitude in the northern hemisphere. In the summer, on the other hand, the Westerlies are relatively cool and serve to protect the Islands from the effects of excessive heat.

As a result of these influences, the climate of the British Isles is markedly equable. No town therein has a mean temperature for January (the coldest month of the year) below freezing-point, and in no part does the mean temperature for July (the hottest month) exceed 65°F. As the winter warmth comes mainly from the Atlantic on the west, the temperature decreases from west to east, and at this season the whole west coast from the north of Scotland to the Isle of Wight experiences much the same temperature conditions.

In the summer, however, the warmth of the region is due much more to the influence of the sun than to that of the sea, hence the south is warmer than the north, and the temperature experienced in different parts of the country falls with increase in latitude. On the whole the western parts of the islands are more equable than the eastern parts, which are *relatively* extreme, especially in the south-east round London.

Rainfall

Besides being of such great value as carriers of warmth, the Westerly winds are responsible also for the plentiful rainfall of the Islands. In the flow of air of which they are composed are numerous travelling atmospheric *depressions* or *cyclones*, one of which reaches the British Isles on an average every ten days, though they are much more frequent in winter than in summer. These cyclones release their moisture in the form of rain, hail or snow. Thus the rains, like those of all countries lying within the region of the Westerly winds, are cyclonic in character and are not so dependent on the effect of high land in forcing the air to rise as are those of lands within the Trade wind regions. Though mountains and hills lying across the path of the winds cause a greater precipitation, regions where there are no hills receive an adequate rainfall.

Since the chief uplands of the Islands lie in the west, they increase what would in any case be an abundant rainfall. Hence, the rainfall of the British Isles diminishes from west to east; but though there is a heavy rainfall over the western portions of both Great Britain and Ireland—heaviest where the high land lies near the coasts—even to the east of the highland and over the eastern lowlands of England there is no lack of rain (Fig. 165).

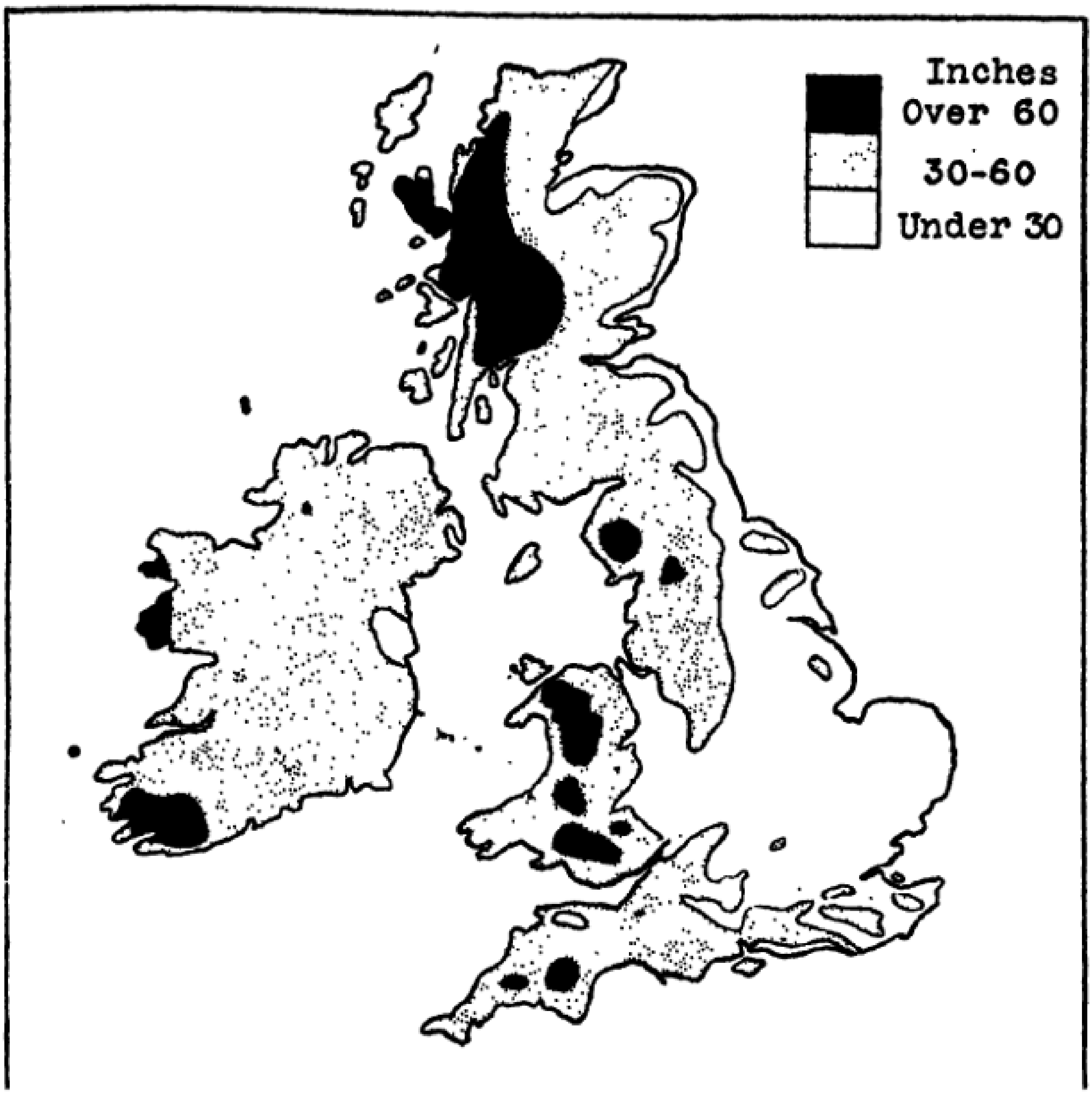


FIG. 165: THE MEAN ANNUAL RAINFALL OF THE BRITISH ISLES.

Another important effect of these cyclonic storms is that they attract air from all directions, and thus the area affected by them may receive winds from any point of the compass. It is for this reason that, though the British Isles lie throughout the year in the region of the Westerly winds, yet in January, when depressions are most prevalent, 24 per cent. of the recorded wind directions are between south-east and north-east, indicating the prevalence of cold winds drawn in from over the continent.

The cyclonic depressions which reach the British Isles travel in the general direction of the Westerlies, *i.e.*, from west to east, but they follow well-defined tracks. Of these the most frequented lie along the western border of the islands, from the south-west, up the coast to the north of Scotland and past the mouth of the North Sea.

Anticyclones, which are associated with dry, fine weather and clear skies, occur in these islands less frequently than cyclonic conditions, and, as the conditions associated with anticyclones are more stable and last longer than the conditions associated with cyclones, the result is that long periods of really fine weather are the exception rather than the rule in this country.

PRIMARY INDUSTRIES

Fishing

The fisheries of the British Isles are of great value and give rise to an important industry which contributes largely to the nation's food supply. The Home Fishery Regions—*i.e.*, the North Sea, the Irish Sea, St. George's Channel, the Bristol Channel, the English Channel, and the shallow waters off the northern, western and southern coasts of Ireland—are very important, and constitute the traditional British fishing grounds. The advent of the steam fishing vessel has, however, greatly extended the field of activity, and the British fishery area now extends over more than a million square miles, from the coastal waters off Morocco in the south to the Arctic Ocean in the north.

Fish of many kinds are taken in the various British fisheries. They may be divided into two classes: those found on or near the sea-floor and those caught at or near the surface. The former class is the larger and includes haddock, brill, sole, plaice, halibut, turbot and cod. The second class includes the smaller fish, such as pilchards, herrings, mackerel and sprats.

Herring and cod provide about 60 per cent. of the total weight of fish caught and landed at ports in the British Isles, and they also supply the bulk of British fish exports. The herring is found mainly in the North Sea, but the cod is most plentiful in colder waters, the greatest catches being in the fisheries off Iceland. The "post-slump" export of herrings to Central Europe was very large, but with the fall in prices and the decrease in purchasing power this trade has declined considerably, despite efforts to improve conditions. Whereas, in 1929, over 300,000 tons of herrings were exported, by 1933 the trade had declined to 132,000, whilst for the same years the total fish export had decreased from over 400,000 tons to less than 200,000 tons. The development of fish canning, which has already commenced in a small way, will be of some assistance.

Herrings spawn earlier in the colder north than in the warmer southern waters and thus they are ready to be caught earlier in the north than in the south. The season commences in the early spring off the coast of Norway and the fishing vessels gradually move south, being off eastern Scotland (Aberdeen) in the summer and off eastern England (Lowestoft and Yarmouth) in the autumn. As the boats travel south, so do the Scottish fisher girls who pack the fish for export or prepare them for curing.

As fish migrate in search of food as well as for breeding purposes, the fishing vessels have either to follow them from place to place or to go after different types of fish. In the early spring the herring, a cold-water fish which lives near the surface, is caught off the Norwegian coast. Later in the spring, when food becomes plentiful off the *west* coast of Scotland, the fishing fleets from the Irish Sea follow the shoals to the Hebrides and Shetlands. In the summer, the shoals are plentiful off the *east* coast of Scotland, and in autumn they appear off Yarmouth and Lowestoft. Clearly, therefore, the Yarmouth and Lowestoft fleets cannot be employed in herring fishing during the early part of the year, and during that season they sail to the Devon and Cornish coasts in search of mackerel.

The hake is an important British fish which " moves " from south to north. In winter it is found off the coast of Morocco, and is followed northwards along the coasts of Portugal to the west of Ireland, and finally to the Firth of Clyde. The cod, which spawns earlier in the north than in south in the same way as the herring, reaches the south coast of Ireland and the North Sea. Pilchards are found in the warmer waters of the English Channel, but are chiefly caught when young off the coasts of Brittany and preserved as " sardines " (*cf.* young herrings in the Norwegian fjords). The sole is caught chiefly off the south coast of England, " Dover soles " being a specially well-known variety.

Though the fishing regions visited by British ships are so extensive, the industry is centralised at a few large ports. The most important of these are Grimsby, Hull, London, Lowestoft, Yarmouth, Fleetwood, Milford, North Shields and Aberdeen. Most of these centres are situated on the North Sea, the greatest of British fishing grounds, wherein the famous *Dogger Bank*, rising to within 60 feet of the surface in the centre of the sea, literally teems with fish. The west and south coasts of Britain are, comparatively, of small importance as centres of the fishing industry, while Ireland has no great fishing centre, though its surrounding seas are extensively worked by vessels from Fleetwood, Cardiff, Milford and Liverpool.

Forests

The climatic conditions of the British Isles make deciduous forest the natural vegetation, and there is no doubt that the islands were at one time densely wooded, but the forests were mostly destroyed centuries ago, and now less than 5 per cent. of the British Isles is covered with trees. Forestry is therefore of little importance in the British Isles, and almost all our supplies of timber are obtained from abroad. Nevertheless, the Government in recent years has devoted its attention to the need for conserving forests as much as possible, and a special Department devotes itself to the question of replanting areas from which timber has been cut and to allied matters of afforestation.

Pastoral Industries

The greatest area of pasture land is in England, though there are also extensive areas in Ireland, Scotland and Wales.

CATTLE are reared mainly in the western lowlands of both Great Britain and Ireland, where there is abundant rainfall and an equable climate. In England and Wales cattle are reared chiefly in Cheshire, Lancashire, Pembrokeshire, Cornwall, Devonshire, Somersetshire, Herefordshire, Staffordshire and Leicestershire. Cattle rearing is general throughout Ireland, but the counties of Limerick, Meath and Dublin, in the Irish Free State, are the most important districts. In Scotland no county has many cattle. British beef is of very good quality but the quantity is very inadequate for home needs and large supplies have to be imported (see Chapter 11), but live cattle provide a large proportion of the total exports of the Irish Free State.

Dairying is important in several low-lying parts of the Islands where there is specially rich pasture, as in the Irish Free State, an important dairying country with dairy produce as a leading export. Devonshire and Cornwall are justly famous for their cream, and many other parts of Great Britain produce excellent butter and cheese, *e.g.*, Somerset (Cheddar) and Cheshire. As in the case of beef, however, large quantities of dairy products are imported (see Chapter 11).

The great demand for dairy products in densely populated areas has caused important pastoral industries to develop in the vicinity of the market in regions where the production of these products would otherwise be uneconomic. An example is the dairying industry around London in the relatively dry south-east of England, where proximity to the market and large-scale production counteract the increased costs due to less favourable natural conditions.

SHEEP, which thrive on higher ground and poorer pastures than cattle, are found in the largest numbers on the Southern Uplands of Scotland, the Welsh Uplands, the Pennines, the wolds of Lincolnshire and Yorkshire, the Cotswolds and the hills of south-eastern England. The sheep found in the west are reared chiefly for mutton while those feeding on the hills of the east are reared for both wool and mutton.

The Southern Uplands of Scotland are noted for their sheep of the famous Cheviot breed. These yield both wool and mutton of fine quality and supply most of the raw material for the woollen industry of the Tweed valley. The Cotswolds, Leicesters and Lincolns are all valuable for their wool, while the Welsh, Shropshire and South Down sheep are short-woolled and famous for their mutton, which is of excellent quality. The meat from the spring lambs is specially sought after and finds a wide market.

Pigs are bred in the largest numbers in Ireland, particularly in the south-east, and large quantities of bacon and ham are exported to England. Many pigs are reared in England, also, the bacon of Wiltshire and the hams of Yorkshire and Cumberland being specially famous.

Horses are now reared in the British Isles mainly for farm work and for military or sporting purposes. They are bred in many parts, but chiefly in the lower and drier regions. In England, the chief areas are Yorkshire, Norfolk, Cambridge and Huntingdon ; in Ireland—Dublin, Down, Wexford and Louth ; and in Scotland—Fife and Linlithgow.

Arable Farming

Cereals.—*Wheat* is grown largely in England where it thrives best in the eastern counties from the Humber to the Thames, *i.e.*, *East Anglia* and the Wash Basin (see Chapter 25). *Barley*, like wheat, is also grown most extensively in eastern England, although it is cultivated to some extent in Scotland and Ireland, where it is used in the whisky distilleries. *Oats* are grown widely throughout the British Isles, especially where the cultivation of wheat is impossible. *Rye*, the only other cereal grown in these islands, is produced only to a small extent, usually as fodder and in parts where the other cereals cannot be cultivated.

Root Crops.—*Potatoes*, cultivated chiefly for human consumption, are produced in most parts of the Islands, but most extensively in Ireland. *Turnips*, *swedes* and *mangolds* are all widely grown as food for animals. The cultivation of *sugar-beet* is making considerable headway in the eastern counties of England under the stimulus of the subsidy paid by the Government, and Britain now supplies one-fifth of her total sugar requirements (see Chapter 11).

Hops, for the manufacture of beer, are an important product of Kent, of Worcestershire and the neighbouring counties.

Flax is grown for the manufacture of linen in Northern Ireland.

Fruits and Vegetables.—Only the hardier varieties of fruits, such as apples, plums and cherries, are grown in any considerable quantity. As the fruits need a fertile soil and an equable climate, with protection from cold winds and a mild spring, they are grown chiefly in sheltered lowland areas and particularly in river valleys.

In Britain the chief fruit-growing regions are the Lower Severn Valley and the south-eastern counties in England, and the Carse of Gowrie in Scotland. In all these districts jam manufacture is carried on, notably at Dundee, Cambridge and London.

Near all the large towns there are stretches of "market gardens" which supply the town markets with vegetables and flowers, while glasshouses, notably in the Lea valley, furnish grapes and tomatoes. Early fruits, vegetables and flowers reach London and other centres from the mild south-west of England, the Scilly Isles and the Channel Islands. Kent has nearly half the orchards in Britain and produces strawberries, cherries, apples, pears and plums. Hampshire, Cambridgeshire, Cheshire, Yorkshire and Strathmore are noted for their strawberries and the Carse of Gowrie for its raspberries. Hertfordshire, Bedfordshire and Buckinghamshire produce large quantities of apples and plums, while the belt of country from Hereford through Gloucester and Somerset into Devon is celebrated for its apples and pears, from which are obtained the famous cider and perry of the west. Gooseberries and red and black currants are grown throughout the country. The only British nuts which have proved commercially successful are Kent cobs, walnuts and Norfolk chestnuts. In Scotland and Ireland the best fruit-growing regions are the counties of Perth, Armagh, Antrim and Cork.

The most recent development in the fruit industry is the extension of the fruit preserving and canning industry, which is rapidly making headway. The tins are made chiefly at Worcester, in a fruit-growing region, and at Acton, which is conveniently situated for the import of the raw material. Usually the tins are sent to the factories as sheets of metal, where they are assembled, filled and finally sealed. The canning factories are naturally situated near the fruit-growing regions as, for example, at Paddock Wood (Kent), Evesham and Dundee. In addition to fruits, small vegetables, such as peas, also are tinned.

Mining and Quarrying

The mining industry of Britain is confined mainly to coal, which comprises about 90 per cent. of the value of the total mineral output of the country. Iron is next in importance, but is far behind coal. Tin, lead, zinc, copper, salt and rare metals (such as wolfram and tungsten) are mined in small quantities. The relative importance of coal, iron, zinc, lead and tin is shown in the Table below.

Principal Mineral Products of Britain

IN THOUSANDS OF METRIC TONS

Mineral	1913	1929	1932
Coal	292,000	258,000	208,000
Iron	16,000	13,000	7,000
Lead	25	23	40
Zinc	18	2	0.01
Tin	5	5	2

Coal-Mining

The situation of the coalfields has already been outlined in Chapter 12 and their economic features are described in Chapter 25.

SCOTTISH FIELDS. These lie in the Central Lowlands—the rift valley of sedimentry rocks. The carboniferous rocks lie in the centre and, as a result of folding, the coalfields are retained in certain basins: the *Ayr coalfield* in the south-west, the *Lanarkshire field* in the centre and the *Fifeshire field* in the north-east. The coalfield of Fife dips under the

Forth and reappears on the Edinburgh and Haddington coast where it is known as the *Midlothian field.*

NORTHERN ENGLAND.—The coalfields of northern England are grouped round the Pennines in a triangular form, with the apex in south Staffordshire. On the west are the *Cumberland field* in the north, the *Lancashire and Cheshire field* in the centre and the *North Staffordshire field* in the south. On the east lie the *Northumberland and Durham field* in the north, the *York, Derby and Nottingham field* in the centre and the *Leicester field* in the south. The apex of the triangle is formed by the *South Staffordshire and Warwickshire field.* This distribution of the coal measures is a result of earth movements in the form of uplift and fracture of old carboniferous rocks and subsequent folding.

WELSH COALFIELDS.—The highly important *South Wales coalfield* lies in the Old Red Sandstone and Carboniferous area of South Wales. These rocks have been folded in the form of a synclinal trough or basin in a west-east direction. There are also small coalfields in the east and north of Wales.

The remaining coalfields are relatively unimportant, but are discussed briefly in Chapter 25. The reserves of coal in the British Isles are still considerable, and it has been estimated that at the present rate of consumption there is sufficient to last for seven centuries.

Great Britain enjoys special advantages in the production of coal. In comparison with the size of the island the area of the coalfields is very great. Moreover, the quality of the coal is on the whole extremely good. Bituminous, or house coal, is the most abundant of the varieties mined, but steam coal and anthracite of specially fine quality are found in considerable quantities in South Wales.

Another great advantage is the ease with which the coal can be transported from pit head to market, for nearly all the coalfields are at or near navigable water. The Durham and Northumberland field is intersected by the Tyne estuary; the Cumberland field extends to the coast and, indeed, under the sea; the Lancashire and Yorkshire fields, situated in the narrowest part of the country, have easy access to the coast; the South Wales field extends along and near to the north coast of the Bristol Channel; the North Wales field lies near the sea at Chester; the Bristol and Forest of Dean fields lie near the Severn estuary; the Kent field extends to the coast near Deal; and the Midland fields, where the coal is mined comparatively far from the sea, have (owing to the level nature of the country) the benefit of cheap transport by canal and river. In Scotland, also, the coalfields actually extend to the sea or have easy means of communication with the coast.

The great importance of coal-mining as a distinct British industry is apt to be overlooked in considering the great manufacturing industries which it supports, but the fact remains that the coal industry is itself of immense national importance. It is second in importance to the agricultural industry of the country, employing in normal times nearly

1,000,000 people, and about one-twelfth of the population of the country is directly dependent on it. Even with the steady decline in the industry which has been taking place in recent years, the total value of the coal production is still about £150,000,000 annually. Much of this output is used, of course, as the foundation of the whole industrial life of Britain, but coal is also of great importance to our export trade, since the value of the shipments of coal sent overseas amounts to over 5 per cent. of the total value of our exports.

Apart from this direct advantage of coal as a factor in trade, there is the indirect advantage that coal shipments provide outward cargo for the ships which bring to us imports of foodstuffs and raw materials.

There is consequently a saving of outward clearances in ballast, and the freight on imported goods is lower than it would be otherwise.

South Wales exports coal to the countries of the Mediterranean; Northumberland and Durham supply London, the North Sea countries and the Baltic States; Ireland obtains her coal supplies from Ayrshire; and the majority of the coaling stations of the world (*e.g.*, Madeira, Gibraltar, Malta and Aden) receive coal from Britain.

See also Chapter 12 for commerce in coal.

Iron Ore

The production of iron ore in Great Britain shows a steady decline. Originally, the greater part of the iron ore production was obtained from the iron ore deposits in and around the coalfields, a factor which materially contributed to the growth of the British iron and steel industry, but these deposits are almost exhausted, the largest production of coal measure ores being from the North Staffordshire coalfield.

About 90 per cent. of the iron ore mined in Britain is now obtained from the Jurassic ridge, particularly from the *Cleveland Hills* of Yorkshire and in *Northamptonshire*. Other deposits are worked in Lincolnshire, Rutlandshire and elsewhere. The development of the Northampton deposits is a recent tendency and the output is increasing at the expense of the Cleveland district, largely because of the increasing difficulty in working the Cleveland deposits and the higher iron content of the Northampton ores.

The *West Cumberland* district around Cleator and the *Furness* district of North Lancashire are important, although the output is small, because they contain the only deposits of *hæmatite* in the British Isles, the bulk of the production being obtained from Cumberland.

The scarcity of hæmatite and the decreased home production of iron ore make it necessary for Britain to obtain additional supplies from abroad, and about one-third to one-half of the ore used in Britain is imported, mainly from Spain, Sweden and North Africa. These imported ores are utilised at the coastal iron and steel centres because of the expense of transport inland. About one-third of the total imports is consumed at Middlesbrough.

Other Minerals

TIN.—Many years ago Cornwall was an important producer of tin, but the workings are now nearly exhausted and the present production is almost insignificant when compared with that of the great tin producing countries of the world.

Cornwall also produces small quantities of *wolfram* and *tungsten*.

COPPER.—There is now no copper ore mined in Britain, but a little copper precipitate is obtained by chemical decomposition brought about by placing scrap iron in the water, containing copper salts, which issues from certain mines and open works.

LEAD is mined to a small extent in North Wales (Flint), the Southern Uplands of Scotland, Cumberland, the west of Durham and in the southern part of the Pennines (Derbyshire).

ZINC is found in small quantities in Durham, Cumberland, North Wales and the Isle of Man, but the output is very small.

OIL SHALE is mined in the Lowlands of Scotland, chiefly in Midlothian and East Lothian. The oil shale produces about 25 gallons of crude oil per ton. This oil, on being refined, produces naphtha, lubricating oils, gas oils and burning oils.

SALT is mined mainly in Cheshire at Northwich, Middlewich, and Nantwich; in Worcestershire at Droitwich; in Durham near the Tees estuary; and in Lancashire near Fleetwood. Yorkshire, Staffordshire and the Isle of Man also are producers. The salt is usually obtained by pumping brine out of the mines and by separating the salt by evaporation. Very little salt is obtained by direct mining of the solid salt rocks.

FLUORSPAR, in the form of "lump spar" and "gravel spar," is extensively produced in England, mainly in association with lead and zinc veins, in Durham, Derbyshire and Yorkshire. It is widely used as a flux in the iron and steel industry and is also exported.

Building Stones

GRANITE is quarried principally in the east of the Scottish Highlands (Aberdeen and Peterhead), Devon and Cornwall, Cumberland, Leicestershire (Charnwood Forest), Carnarvon and the mountains of Wicklow in the Irish Free State.

LIMESTONE is obtained at many places in the limestone ridge running from the mouth of the Exe to the mouth of the Tees. Portland, Bath and Mansfield are important centres.

MARBLE is quarried in England at Purbeck (Dorset), in Devonshire, Derbyshire, Durham and Sussex and in Galway and Kilkenny in the Irish Free State.

SLATE comes chiefly from North Wales, Cumberland, Cornwall, Lancashire, the Isle of Man and the Highlands of Scotland (Argyllshire). It is not so important as formerly owing to the use of tiles for roofing purposes.

CLAY is dug for making bricks and tiles in many parts of south-eastern England, Peterborough being an important centre. Clay fit for coarse pottery is obtained in many districts, but china clay, or kaolin, is obtained only from Cornwall (90 per cent.) and Devonshire, whence it is taken by sea to Liverpool and thence by canal to the Potteries. *Fireclay*, used for lining furnaces, is found in many parts, chiefly on or near the coalfields, and particularly around Sheffield.

CHALK, from which cement is made, is abundantly available in south-eastern England and cement making is carried on at various places in Cambridgeshire, Hertfordshire, Bedfordshire and Kent.

MANUFACTURES

The Cotton Industry

This is the most important manufacturing industry in the British Isles. The principal centre is on the Lancashire and Cheshire coalfield, west of the Pennines—the most thickly populated part of the country.

The reasons for the localisation of the industry have been discussed in Chapter 14. Briefly, they include (1) the *original* factors—(*a*) the soft water of the Pennines, which had already attracted other textile industries and could be used for power; (*b*) the damp climate, without which (unless artificial humidity is provided) the thread would become brittle and liable to snap during the spinning process; and (2) the *subsequent* influences—(*a*) the local supplies of coal and iron; (*b*) the facilities for importing American cotton (which forms the bulk of our supply) and of exporting the finished goods through Liverpool and Manchester; (*c*) the local supplies of salt from which chemicals for bleaching and dyeing are manufactured; (*d*) a water supply suitable for dyeing; and (*e*) the skill of the operatives, intensified as a result of generations of contact with the processes.

In all the cotton towns spinning, weaving, dyeing and printing are carried on to some extent, but certain groups specialise in one process. The great spinning towns are *Bolton*, *Bury*, *Rochdale*, *Oldham*, *Ashton* and *Manchester*, the last-named being also the great market and administrative centre for the whole industry and for the whole district. These towns all lie in the south of Lancashire. The great weaving towns, on the other hand, lie farther north. They are *Preston*, *Blackburn*, *Accrington*, *Burnley*, *Nelson* and *Clitheroe*.

The different nature of the cotton manufactures of Nottingham shows the influence of the drier climate of that area. Here only the coarser type of fabric is made, since the absence of the damp atmosphere for which Lancashire is noted made impossible the weaving of finer threads.

The Lanarkshire coalfield, around *Glasgow* and *Paisley*, also has a cotton industry, but it is much less important than that of Lancashire. Here the localising factors, as already stated, were the power available, the damp climate and the ease with which the raw cotton could be obtained from North America—Glasgow is nearer than Liverpool to the great cotton producing areas of the United States. In spite of these favourable factors, however, the cotton industry of Lanarkshire is far less important than that of Lancashire, mainly because the former area finds it more profitable to devote most of its energy to the building of ships, for which it has pre-eminent advantages.

Woollen Industry

The woollen industry of Britain is much more widely scattered than the cotton industry.

The West Riding of Yorkshire, however, is by far the most important and most highly localised of the woollen manufacturing centres of the British Isles. Wherever the industry flourishes the original causes of its establishment were (*a*) local supplies of wool from near-by sheep pastures, and (*b*) the presence of streams which provided both power and water for cleaning and dyeing the wool. Later, when the industry moved from the home to the factory, the accessibility of supplies of coal became the most important determining factor; and when the local supplies of wool proved to be quite inadequate to meet the needs of the growing industry, enormous quantities of the raw material had to be imported mainly from Australia, New Zealand and South Africa.

The factors which now make Yorkshire so eminently suitable for the woollen industry are: (*a*) the large local supplies of both coal and iron, and the local development of machinery manufacture; (*b*) the special transport facilities provided by the estuary of the Humber, and the rivers and canals connecting with it, both for the import of the raw material and for the export of finished goods; (*c*) the proximity of the North European market; and (*d*) the existence of an ample supply of labour skilled in the processes of the industry as a result of generations of contact with it.

Leeds, situated where the Aire valley broadens out to the plain of the West Riding of Yorkshire, is the commercial centre of the district and an important manufacturing town. Here, coarse woollens, such as blankets, flannels and coarse cloths, are manufactured in large quantities, and there is also an important manufacture of ready-made clothing of all descriptions.

Bradford is the true centre of the woollen industry, however, and manufactures every kind of woollen fabric. It has great mohair factories and produces carpets, worsted yarns and worsted cloths (especially for men's suitings) whose fame has spread to all parts of the world. Other towns similarly engaged are *Halifax* (carpets), *Huddersfield* (broadcloth), *Wakefield* and *Keighley*.

Batley and *Dewsbury* work up old woollen cloth and wool waste into "*shoddy*" and "*mungo*," the names given to re-manufactured cloths and material of poor quality.

The West Country woollen industry of Somerset, Wiltshire, Oxford, Berkshire and Gloucestershire arose as a result of the abundant pasture and the water-power of the Cotswolds, and remained because of the presence of adjacent coalfields (*i.e.*, those of Bristol, South Wales and the Midlands). It is now relatively unimportant, the weaving and finishing of special types of cloth alone remaining, *e.g.*, broadcloth at Stroud, blankets at Witney and serge at Ashburton.

In The Midlands, *Leicester* and *Nottingham* specialise in woollen hose and in mixed woollen and cotton fabrics. Here the industry owes its development mainly to local wool and coal.

The Scottish Woollen Industry is centred in the *Tweed Valley*, where the famous tweed cloth is made at *Hawick*, *Jedburgh*, and *Galashiels*, and at *Dumfries* in the Nith Valley. Water-power and local wool supplies from the Cheviots were the original causes of the rise of this industry, but coal from the Midlothian field and some imported wool is now utilised.

In Ireland, the Hebrides ("Harris" and "Lewis" tweeds) and the Shetlands, woollens are made on cottage hand-looms.

Welsh Woollens are made at *Swansea* and flannels at *Cardiff*, and at *Newtown* and *Welshpool* in the upper Severn Valley.

Carpets are made in the *West Riding* of Yorkshire, as well as at *Kidderminster*, *Wilton*, *Kilmarnock*, *Dundee* and *Ayr*.

Jute Industry

The jute industry became localised at *Dundee* and *Kirkcaldy* owing to the fact that, before the Crimean War (when supplies of Russian hemp were cut off), these towns were engaged in the production of hempen sacks and were, therefore, well suited for the production of gunny (jute) bags, which involved similar manufacturing processes.

The jute is obtained from Bengal and made into carpets, oilcloth and sacking.

Linen Industry

The linen industry is important in Northern Ireland, principally at *Belfast*, *Londonderry* and *Lisburn*. Local flax, the climate, suitable water and supplies of female labour were the localising factors. Seven-eighths of the flax used is now imported from Belgium, Scandinavia, the Baltic States, Canada and the U.S.S.R.

In Scotland, *Dunfermline* specialises in the damask trade, while *Arbroath* and *Montrose* make coarse linens and sail-cloth. Other centres are Kirkcaldy, Dundee and Forfar. Coal is easily available from the Fifeshire fields and flax is imported from Scandinavia. Manchester has the only linen industry of any importance in England.

Silk Industry

Though it has developed amazingly in recent years, the silk industry of this country is relatively unimportant. It is a "luxury" industry centred at *Macclesfield*, *Leek* and *Congleton*, the silk being imported chiefly from France, Italy, Japan and Spain.

RAYON (artificial silk) has become established to a large extent in the "older" textile centres because there the necessary water supplies and transport facilities were already available, and later the manufacturers were able to apply their knowledge to the production of mixed fabrics (*i.e.*, rayon mixed with cotton, wool and silk). Rayon and mixed fabric industries have thus arisen at Manchester and Bolton in the cotton district of Lancashire; at Bradford, Huddersfield, Halifax and Keighley in the West Riding; at Macclesfield and Leek in the silk manufacturing area; at Nottingham, Leicester and Coventry in the Midlands, and at Glasgow and Paisley; whilst other centres are found in eastern England, such as at Braintree and London. (See also Chapter 14.)

The Iron and Steel Industry

The iron and steel industry (see also Chapter 14) is next in importance to the cotton industry. The principal blast-furnace centres are at *Middlesbrough*, in Yorkshire; at *Swansea*, *Cardiff*, *Newport*, *Neath*, *Merthyr* and *Llanelly* in South Wales; in *Staffordshire*, *Cumberland*, *North Lincolnshire* and *Lancashire;* at *Sheffield*, *Rotherham* and *Leeds* in the West Riding of Yorkshire; and at *Airdrie* and *Coatbridge* in Scotland. The manganese required by the blast furnaces is imported from India.

Middlesbrough still has the largest production of pig-iron, but political and economic considerations, such as the tariff on imported pig-iron (which provides an opportunity of still further developing our own blast-furnace industry) and the decline in shipbuilding (whereby large quantities of steel need not be produced at the coastal centres), are tending to make the iron and steel industry more widely spread, particularly in the Midlands at such centres as Frodingham (Lincoln), Banbury (Oxford) and Corby (Northampton), all of which lie on the Jurassic ridge. Development at Corby has been particularly active, for here geographical factors are favourable, including the presence of vast ore beds near the surface, proximity to the great cast and wrought iron manufacturing area lying between Birmingham, Wolverhampton and Stourbridge, and cheap transport by canal and main line railways.

Heavy iron goods are made on or near the coast, *e.g.*, bridges at *Darlington;* girders at *Frodingham* and *Middlesbrough;* ships on the *Clyde* and the *Tyne*; rolling-stock, heavy boilers and machinery at *Gateshead* and *Stockton-on-Tees*; and steel rails at all coastal iron ports. Light iron goods which are of higher value for small bulk and so are able to bear the cost of railway transport, are made further inland, *e.g.*, at *Birmingham* (motor engines, cycles, screws, nails and pressed steel goods), *Derby* and *Sheffield* (cutlery).

Such goods as locomotives and motor-cars may also be made inland, for, though they are heavy, they can "take themselves to market." Hence railway engines are made at such centres as Crewe, Derby and Darlington, while the motor car industry flourishes at Coventry, Birmingham, Cowley (Oxford) and Luton, as well as in several places near London, notably Slough, Hendon and Edgware.

An important branch of the iron and steel trade is the *shipbuilding* industry which flourishes on navigable estuaries (*e.g.*, the *Clyde* and the *Tyne*) situated in or near coal and iron regions. The chief centres are *Greenock*, *Port Glasgow*, *Dalmuir*, *Dumbarton* and *Clydebank* on the Clyde, which produces about one-third of Britain's entire shipbuilding output; *Newcastle*, *Wallsend*, *Jarrow*, *North Shields* and *South Shields* on the Tyne; *Sunderland* at the mouth of the Wear; and *Middlesbrough* and the *Hartlepools* at the mouth of the Tees.

Other centres are at ports to which coal or iron, or both, can be carried cheaply, such as *Southampton*, *Hull*, *Liverpool*, *Birkenhead*, *Barrow* and *Belfast*. The Government dockyards are at *Chatham*, *Sheerness*, *Portsmouth*, *Devonport* and *Rosyth*.

Since the "boom" year of 1920, the shipbuilding industry has passed through a stage of intense depression, but Britain still retains her lead as the chief shipbuilding country, with the United States, Germany and Japan following next in order.

Chemical Industries

The chemical industries are extremely important, for upon them depends the whole structure of modern industry. The existence of coal and salt is an essential localising factor, whilst the necessity for import of many of the substances needed in the industry also affects localisation. The leading chemical centres are, therefore, as we should expect, situated in or near coastal areas where supplies of coal and salt are easily accessible, either locally or by means of cheap transport facilities. The regions possessing some or all of these factors include Cheshire and South Lancashire, the West Riding of Yorkshire, the Scottish Lowlands, the north-east coalfield and the London area. Coal, however, has now ceased to be an important factor because of the use of electrolytic methods.

The heavy chemical section is the basis of the chemical industries because it produces a variety of chemical products which are widely used in other branches of the industry. Mineral acids are produced chiefly in South Lancashire, from Liverpool to Manchester; the largest alkali manufacturing region in the world is situated in the region of the Mersey (particularly at Northwich) and at Fleetwood in North Lancashire, where all the necessary localising factors are available; and the production of artificial fertilisers has become of great importance at Billingham-on-Tees in Durham.

The coal-tar section of the industry produces many chemical products, the leading areas of production being in north and south Lancashire, the Black Country, the north-east coalfield, the West Riding, Staffordshire, the London area, the South Wales coalfield and at Bristol. Coal-tar dyes are important in the textile centres of south Lancashire and the West Riding and at Perth in Scotland.

The production of soap and margarine needs large quantities of fats and oils which must be imported and hence the industry is mainly centred at ports near supplies of chemicals and power. The most important soap-manufacturing region lies in south Lancashire at Port Sunlight (where the well-known firm of Lever Brothers is situated), Liverpool, Warrington, Widnes, Manchester and Accrington; Greater London; and in the West Riding at Hull, Leeds and Huddersfield among other places. The manufacture of margarine is naturally also centred at coastal situations, particularly in the Mersey ports and at Hull.

Leather Industries

The localisation of *leather making industries* is determined by the supply of raw materials (hides and tanning chemicals) and coal. Tanning materials are obtained from the bark of suitable trees or by chemical means and will bear reasonable costs of transport, so that leather goods are made either at the ports which are best suited for the import of hides [*London* (Bermondsey), *Hull*, *Manchester*, *Perth*, *Belfast*, *Newry*, *Londonderry* and *Coleraine*] or at collecting centres for pastoral regions situated near the coalfields [*Northampton*, *Leicester*, *Leeds*, *Stafford*, *Birmingham*, *Walsall* and *Norwich*]. Refer also to Chapter 14.

Pottery and Glass

The pottery industry of Staffordshire ("the Potteries") was established owing to the large deposits of *clay* which were found in the neighbourhood in proximity to coal supplies, and also because of the presence of *local salt* and *lead* for glazing. At present, kaolin for the making of porcelain and china is obtained principally from Cornwall and Devonshire. The "five towns" of *Stoke*, *Hanley*, *Burslem*, *Longton* and *Tunstall* are all engaged in the industry (see also Chapter 14).

Suitable sand for *glass-making* is found in several parts of the British Isles but the most important localising factor is ready access to the necessary chemical products, notably soda and potash. The chief glass-making region is therefore situated in the chemical zone of south Lancashire, with St. Helens as the leading centre of the industry. Other glass-making industries have arisen in the Sheffield district, at Leeds, in the north-east coalfield and at Glasgow, Stourbridge, Birmingham and London.

Tin-Plate Manufacture

Tin-plate, *i.e.*, sheet iron or steel covered with a thin coating of tin, is manufactured on a large scale at *Swansea*, *Briton Ferry*, *Llanelly* and *Neath* on the South Wales coalfield. Coal and palm oil as well as iron and tin are needed for the manufacturing process. The tin used by British tin plate manufacturers was formerly obtained from Cornwall, but the greater part now comes from Malaya. Palm oil is imported from West Africa, and the bulk of the iron from northern Spain, *via* the ports of Bilbao and Santander.

Flour-Milling

Because 70 per cent. of the wheat used in the United Kingdom comes from abroad, flour-milling on a large scale is carried on at the great ports, *e.g.*, *London*, *Hull*, *Goole*, *Newcastle*, *Leith*, *Glasgow*, *Liverpool*, *Cardiff*, *Swansea* and *Bristol*. There are, however, numerous smaller mills inland at the market towns near the centres of the home wheat-growing districts, *e.g.*, at *Peterborough*, *Spalding* and *Brigg*.

Chocolate Manufacture

The basic raw material for the manufacture of chocolate is cocoa, and as this commodity is wholly imported into this country, one might expect the chief centres of the chocolate industry to be localised at the ports. Cocoa, however, is of comparatively high value for small bulk and can stand the cost of transport to inland centres in the neighbourhood of dairying industries, where milk is easily available, where there is ample cheap land available for factory sites and where clean, healthful surroundings benefit both the processes of manufacture and the workpeople. To these places, the other chief ingredient, sugar, can also be transported from the ports or manufacturing districts.

The most important centres of the chocolate industry in Britain are at *York*, which is in the centre of the agricultural district of the Plain of York; and at *Bournville*, in beautiful surroundings near a dairying district. There are chocolate factories also at *Bristol* and *London*, which have the double advantage of being surrounded by pastoral country and of being ports to which the cocoa and sugar can be brought without transhipment or rail carriage. London also has the additional advantage of a specially large market close at hand.

COMMUNICATIONS

Railways

The closest network of railways in the British Isles is naturally round the great towns in the industrial areas. The foremost railway centre is London, whence lines radiate to all parts of the country, including the main lines of the four great railway companies, *viz.*, the *London, Midland and Scottish Railway* (L.M.S.R.); the *London and North-Eastern Railway* (L.N.E.R.); the *Great Western Railway* (G.W.R.); and the *Southern Railway* (S.R.). Each of the great industrial towns and the principal ports has its own local "system" of lines serving the surrounding district and connecting with the main lines. There are in the islands at present over 20,000 miles of railway, all of the standard (4ft. 8½ in.) gauge.

The principal railway lines are given in Fig. 143, which should be closely studied in conjunction with a physical map.

The L.M.S.R. System

The L.M.S.R. "Midland" Route runs from St. Pancras Station, London, and serves the leather, hosiery and lace industries of the east Midlands, the steel industry of Sheffield and the West Riding woollen industry. On its path northwards, it uses the *Luton Gap* to cross the Chilterns, and then runs across the Midland Plain to Sheffield, skirts the Pennines to Leeds at the eastern end of the *Aire Gap*, and after crossing the Pennines by this gap passes through the Ribble and Eden valleys to reach Carlisle.

The other L.M.S.R. route from London to Carlisle ("the West Coast Route") serves the Black Country and the Lancashire cotton industry. It proceeds from Euston *via* the *Tring Gap* and Bletchley to Rugby, and over the Midland Plain to Stafford, Crewe and Warrington, across the Mersey, over the Lancashire Plain to Lancaster, and thence *via* the Lune valley, Shap Fell and Edendale to Carlisle. From Crewe, an important branch leaves for the North Wales coast and for Holyhead, whence steamers leave for Ireland with passengers, mails and goods.

From Carlisle a line passes along the valley of the Annan (Annandale) and the upper Clyde to Carstairs, and thence (i) along the Clyde to Glasgow, and (ii) north of the Pentland Hills to Edinburgh. Another route from Carlisle follows the coastal plain to Dumfries and thence continues up the Nith Valley (Nithsdale) and across the Ayrshire Plain to Kilmarnock and Glasgow. These two lines serve the important Clyde Basin. From Glasgow, Carstairs and Edinburgh lines run to Stirling (in a gap between the Lennox and Ochil Hills), and to Perth (between the Sidlaw Hills and the Grampians). From here the Tay and Spey valleys are used to reach Inverness, and thence the coastal plain provides a route to Wick and Thurso in the extreme north. A second line from Perth runs between the Sidlaws and Grampians and along the east coast to Aberdeen and Inverness.

The L.N.E.R. System

The L.N.E.R. or "North-Eastern" system serves the east coast fishing ports, the eastern agricultural district and the Newcastle industrial area. The main line, known as the "East Coast Route," starts from King's Cross (London), crosses the Chilterns by the *Hitchin Gap*, and thence traverses low land to Peterborough, Grantham, Doncaster (where it runs into the Plain of York), York and Darlington, whence it proceeds along the coastal plain *via* Durham, Newcastle and Berwick, and crosses the Scottish border to Dunbar and Edinburgh. The line then runs over the Forth Bridge to Fife and the Tay Bridge to Dundee and Montrose, whence passengers and goods for Aberdeen and the north have to change for the L.M.S.R. route.

From Newcastle there is an important branch line *via* the *Tyne Gap* to Carlisle whence it continues *via* Liddelsdale and Tweeddale, and through Hawick and Galashiels, up the Gala valley to Edinburgh. The L.N.E.R. also serves the Glasgow region and the West Highlands by a line running from Edinburgh.

Other routes of the L.N.E.R. run (*a*) from Marylebone (London) over the Chilterns by the *Wendover Gap* to Rugby, Leicester, Nottingham and Sheffield, whence one line goes to the east coast *via* Lincoln, and the other across the Pennines to Manchester and the Mersey; (*b*) from Liverpool Street (London) to (i) Colchester, Ipswich, Beccles and Yarmouth, with branches to Harwich, Norwich and Lowestoft; and (ii) up the Lea and Stort valleys to Cambridge, the Cam and Great Ouse Valleys to Ely and over the plain to Lincoln and Doncaster.

The G.W.R. System

The G.W.R. or "Great Western" main line, starting at Paddington (London), follows the Thames Valley to Reading; the Kennet valley and the Vale of Pewsey (between the Marlborough Downs and the North Wiltshire Downs) to Taunton; the Vale of Taunton (between the Blackdown Hills on the south and the Quantock and Brendon Hills and Exmoor on the north) and the Plain of Devon to Exeter; and, avoiding Dartmoor and Bodmin Moor by utilising the coastal plain, it continues to Plymouth and Penzance.

The route to Wales, serving the important South Wales coalfield, leaves the former route at Reading and passes through the *Goring or Thames Gap* (between the Chilterns and the Marlborough Downs) to reach Swindon. From Swindon the main route to Wales goes direct to the *Severn Tunnel*, whilst another line skirts the Cotswolds and Mendips to reach Bath and Bristol (in the Severn estuary). These routes re-unite at the Severn Tunnel, which gives access to Newport (Mon.), whence the line uses the South Wales coastal plain to reach Cardiff, Swansea, Llanelly, Pembroke and Fishguard (for Ireland).

The G.W.R. also serves the industrial towns of the Black Country, the route from Paddington crossing the Chilterns by the *High Wycombe Gap* and running to Warwick, Birmingham, Shrewsbury and Chester.

The S.R. System

The Southern Railway, as its name implies, serves the area to the south of London, and links its London termini—Waterloo, Victoria and London Bridge (*a*) with the cross-Channel ports (Dover, Folkestone and Newhaven); (*b*) with the great passenger port of Southampton; (*c*) with the naval stations of Chatham and Portsmouth; and (*d*) with many popular coastal holiday towns.

The longest main line of the system is that which runs from London to Exeter. This leaves the London terminus, Waterloo, and crosses the chalk uplands of North Hampshire and Wiltshire with little deviation, passing through Basingstoke and Salisbury. From Exeter, lines serve North Devon, Plymouth and mid-Cornwall.

The Southern Railway contrasts sharply with the other great systems in that it serves no great industrial region, but it is the only system serving south-eastern England, including the many holiday centres on the coast, so that it carries an enormous amount of holiday and continental traffic and is used by millions of Londoners for their daily journeys between their homes and businesses. In connection with the railways the Company runs regular steamship services between England and the various ports in France and Belgium.

Irish Railways

In Ireland, where the interior is very flat and where there are many easy passages through the coastal mountains, the railway routes are not determined by the relief of the land so much as they are in Great Britain. Nevertheless, the effect of the physical features on the direction of the lines can be clearly seen by reference to a physical map. In the Irish Free State, the railways radiate from Dublin.

THE GREAT NORTHERN RAILWAY runs northwards along the coastal plain through Drogheda to Dundalk. It then passes inland, to avoid Carlingford Lough and the Mourne Mountains, to Portadown, whence one branch passes through Lurgan and down the Lagan valley to Belfast, while the other goes west along the valley of the Blackwater to Enniskillen and thence northwards to Londonderry, which it reaches *via* the valley of the Rivers Mourne and Foyle. From Portadown two other sections also leave for the north-west and Londonderry, one going north to link up with the Midland Railway which reaches the coast along the valley of the Bann, and the other going west across the mountains of Tyrone to the Mourne valley and Londonderry. The Great Northern line thus unites the Irish Free State with Northern Ireland and links up the various parts of the latter country.

The Great Southern Railway has two routes: (1) across the Central Plain, proceeding due west from Dublin (*a*) *via* Mullingar and Athlone to Galway and Clifden and (*b*) *via* Mullingar and Longford for Carrick and Sligo; (2) inland from Dublin, following the valley of the Liffey and utilising the plain lying to the south-east of the Slieve Bloom Mountains to reach Charleville, whence a branch passes north to Limerick, the main line continuing south to Cork.

As the main line follows its south-westerly course, various important sections leave it to proceed due south along the plains and river valleys to link up the ports on the south coast. One line leaves Dublin to follow the coast plain *via* Kingstown (an important harbour for mail vessels from Holyhead), Arklow and Enniscorthy in the Slaney Valley to Wexford and Rosslare (the port for the English G.W.R. route for Ireland *via* Fishguard). Another leaves Kildare to follow the Barrow valley to Wexford; a third leaves the main line at Maryborough to follow the Nore valley to Waterford, which is also connected (*a*) to the main line by a route which goes due west along the Blackwater valley to Mallow; (*b*) to Limerick by a line which runs *via* the Suir valley and Tipperary; and (*c*) due east to Wexford and Rosslare.

All the towns in the west of Ireland are linked together, and with the main lines above mentioned, by railways belonging to the Great Southern system.

The London Midland and Scottish also has a small section in Northern Ireland, the chief lines of which run from Belfast (1) to Antrim and Londonderry and (2) to Larne.

Canal and River Transport

Although many canals were constructed in different parts of the British Isles at the beginning of the Industrial Revolution, they were sadly neglected when railway and road transport developed and few are now of any great importance. This is particularly true of the barge canals, the only important canals of this type being the *Leeds and Liverpool Canal*, which connects Liverpool with Leeds, *via* Blackburn, Burnley and the Aire valley, and which forms, with the *Aire and Calder Navigation* from Leeds to Goole, a waterway between the Mersey and the Humber. The River Trent also carries some traffic and is connected with the Mersey by the *Trent and Mersey Canal*, which runs through the Potteries from near Burton-on-Trent. The *Birmingham Canals* have connections with the four great estuaries of England and are of considerable importance to the Midlands. This system of canals is joined to the lower Thames and London by the *Grand Junction Canal* and to the upper Thames at Oxford by the *Oxford Canal*.

The ship canals of the country are in quite a different category from the barge canals, and those serving industrial regions are of great importance. The *Manchester Ship Canal*, by far the most important, enables ocean-going liners to travel up the Mersey as far as Manchester, which city has thus been made an inland port of first importance, especially to the Lancashire cotton industry. The canal, which is over 35 miles long and is 26 feet in depth, is available for ships up to 11,000 tons.

The *Berkeley Canal*, from Gloucester to the Severn estuary, is 16 miles long and 15 feet in depth. It is navigable by steamers of 1,500 tons and relieves the congestion of traffic at Bristol.

The *Forth and Clyde Canal*, connecting Bowling and Glasgow on the Clyde with Grangemouth on the Firth of Forth, is as yet available only for large trawlers or small coasters. The *Crinan Canal* and the *Caledonian Canal* also are ship canals, but are not important commercially. (Reference should be made to Fig. 147 in Chapter 19.)

In addition to these ship canals, all the important rivers of the country are constantly dredged in their lower reaches to enable ships to penetrate to the towns lying on their banks. Thus the *Thames*, the *Bristol Avon*, the *Tyne* and the *Clyde* all provide important inland routes.

In Ireland the level surface of the land and the position of the mountains render canal construction fairly easy. Mainly because of the relatively backward state of development of the country, however, there is but a very meagre canal traffic, and the only important canals are the *Royal Canal* and the *Grand Canal*, which connect the River Shannon with Dublin.

Cross-Channel Routes

There are numerous fast, regular services from the British Isles to continental ports and to Ireland, the chief services being under the control of the railways.

CONTINENTAL SERVICES. The *L.N.E.R.* have services from Harwich to the Hook of Holland, Antwerp and Esbjerg, and from Hull to Zeebrugge; the *Southern Railway*, from Newhaven to Dieppe, Dover to Ostend, Dover to Calais, Queenborough to Flushing, Folkestone to Boulogne, Southampton to Havre and Southampton to the Channel Islands; the *G.W.R.*, from Weymouth to the Channel Islands; and the *L.M.S.R.*, from Goole to Flushing and Tilbury to Dunkirk.

IRISH SERVICES. The *L.M.S.R.* services include those from Holyhead to Dublin (Kingstown), Fleetwood to Belfast, Heysham to Belfast and from the Scottish port of Stranraer to Larne. The *G.W.R.* has services from Fishguard to Rosslare and Plymouth to Cork, whilst the *Southern Railway* also runs a service between Plymouth and Cork.

QUESTIONS ON CHAPTER 24

Describe the physical features of the Pennine Chain and the English Lake District. Where do railways cross the Pennine Chain? (*I.S.A. Prelim., Dec.*, 1930)

2. Draw a sketch-map of England and Wales bounded on the North by a line joining the Mersey and Humber and on the South by the River Thames. Indicate on it—
   (a) The districts in which ore deposits are found.
   (b) The coal-fields.
   (c) The districts from which important building stone is obtained.
   (d) The places where roofing slate is quarried. (*I.S.A. Prelim., Dec.,* 1930)

3. You are called upon to make *two only of* the following railway journeys as quickly as possible. State by what route you would go, and mention six of the chief towns you would pass through on the way :—
   (a) Aberdeen to Birkenhead.
   (b) Glasgow to Yarmouth.
   (c) Hull to Plymouth.
   (d) Dundee to Oxford.

   If, instead of being pressed for time, you were anxious to travel as economically as possible, would it make any difference to your choice ? (*S.A.A. Prelim., Nov.,* 1931)

4. Describe, with a diagram, the river system of England south of the Severn and the Great Ouse basins. (*R.S.A., Stage I,* 1930)

5. State, and account for, the distribution of the most important arable areas in Great Britain. (*R.S.A., Stage I,* 1929)

6. Describe the best routes for railway transport between London and the South Coast, and explain the advantages and disadvantages of each of them.

   OR in what ways does Ireland differ from Scotland in coastline and climate. (*R.S.A., Stage I,* 1929)

7. Draw a large sketch-map of that part of England south-west of a line from London to Liverpool. Write an account of the occupations of the people in this area and show on the map each fact or name you mention. (*L.C. of C., Junr.,* 1931)

8. Say what you know of the cultivation of *either* sugar-beet *or* early vegetables in Britain, indicating (a) climatic, soil or other conditions necessary, (b) the areas of production, (c) the importance of the crop. (*I. of B., Pt. I,* 1930)

9. What are the chief routes from England and Scotland to Ireland ? Which one would you choose if you were going to Killarney from your own town ? Say why. (*C.C.S. Prelim., Nov.,* 1930)

10. Choose an important town in Great Britain, not less than two hundred miles from London, and give some account of a railway journey from London to the place selected, stating your route and the chief features, physical and commercial, of the districts through which you travel. (*S.A.A. Prelim., May,* 1929)

11. Briefly describe the distribution of temperature and rainfall throughout the year of the British Isles. What do you understand by the statement, "Britain has uniform climate but variable weather" ? (*C.I.I. Prelim.,* 1928)

12. Write an account of a railway journey *either* from London to Bristol *or* from Manchester to Glasgow. Give a description of the country and the names of towns along the route. (*C.I.I. Prelim.,* 1930)

13. Give the areas within the British Empire which supply Great Britain and Ireland with wheat, sugar, and tobacco. To what extent are these commodities produced in Great Britain and Ireland, and where are the chief areas of production ? (*C.I.I. Prelim.,* 1930)

14. Give some account of the routes by which communications are carried on between Great Britain and the Continent. (*S.A.A. Prelim., May,* 1931)

15. What do you know of English canals? Do you think they are capable of development? (*L.A.A. Prelim., June,* 1930)

16. Give a brief geographical account of *either*

    (*a*) Sheep-breeding in Great Britain

    OR

    (*b*) The fishing industry of Great Britain. (*I. of B., Qual.,* 1931)

17. Account for the concentration of agricultural occupations mainly in the South and East of England. (*I. of B., Qual.,* 1926)

18. Name and state the situation of the chief towns of Great Britain concerned with sea fisheries, and mention any specialities of that industry, stating the parts of the coast where those specialities are carried on. (*I. of B., Pt. I,* 1929)

19. State the position of *one* region in Great Britain noted for the cultivation of fruit, and of *one* noted for dairy farming. In each case write a short description of the region, giving a brief account of its surface and climate, its products, and its nearness to suitable markets. (*C.S., Dec.,* 1926)

20. In the British Isles the winds usually blow from the W. or S.W. What effect has this upon farming occupations in different parts of the British Isles? (*C.S., Feb.,* 1929)

21. Comment on the figures in the following table, and explain the more important differences which you note.

COUNTY	AREA (*in acres*)	WHEAT (*in acres*)	CATTLE	SHEEP
Leicester ...	530,000	16,000	148,000	251,000
Cambridge ...	531,000	78,000	46,000	74,000
Westmorland ...	496,000	nil	76,000	430,000

(*C.S., Jan.,* 1931)

22. Illustrate, by examples taken from Scotland, the way in which the relief of the land influences the direction of railway routes and the closeness of the railway network. (*L.M., June,* 1925)

23. In what respects does the climate of the N.W. Highlands of Scotland differ from that of East Anglia? Show how the climate has influenced the occupations carried on in each region. (*C.S., Dec.,* 1929)

24. Give a brief geographical account of *either*

    (*a*) The silk industry of Great Britain

    OR

    (*b*) The chocolate industry of Great Britain. (*I. of B., Qual.,* 1928)

25. In the case of any four raw materials imported into Scotland state the chief country of origin, the port of entry and the use to which it is put. (*L.M., Jan.,* 1934)

26. Exemplify the principal factors which determine the type of farming and the chief crops in different parts of the British Isles. (*Univ. of London Inter. B.Sc. (Econs.),* 1933)

CHAPTER 25

THE BRITISH ISLES (continued)
THE BRITISH EMPIRE

NATURAL REGIONS OF THE BRITISH ISLES

The British Isles can be divided into a number of distinctive natural regions, as follows: the Scottish Highlands and Islands; the Central Lowlands of Scotland; the Southern Uplands of Scotland; Northern England; the Cheshire Plain; the Severn Basin, the Midland Plain; South-Eastern England; the South-Western Peninsula; the Channel Islands; the Isle of Man; Wales; Northern Ireland; and the Irish Free State.

As it is possible to discuss the regions only very briefly here, the routes across each region should be studied by reference to p. 435 *et seq,* particular attention being given to the gaps and valleys utilised by the roads and railways.

Scottish Highlands and Islands

The relief of this region has already been described (see p. 413). Its mountainous character, the poverty of the soil, the heavy rainfall and the comparatively low temperature—the last mainly the effect of altitude—combine to make it of little value for cultivation, and to reduce its utility for pastoral purposes. Even the glens, though sheltered and so having a less severe climate, are of little agricultural importance, as the heavy rains carry away any loose soil. The region is, therefore, thinly populated, and, as there are no minerals, it has few industries.

There is, however, considerable water power available, and advantage is taken of this at the Falls of Foyers (near Loch Ness) and Kinlochleven (on the borders of Argyllshire and Invernesshire) for the generation of electricity for the extraction of aluminium from local clays, and also from clays imported from France and Ireland, whilst the new Loch Trieg scheme in Invernesshire will eventually develop 130,000 h.p., the largest single water power scheme possible in Great Britain. Moreover, the east coastal plain, which is low-lying and fertile, with a low rainfall and a comparatively high summer temperature, is very favourable both for the cultivation of crops and for the rearing of cattle and sheep. The production of barley led to the establishment of numerous scattered whiskey distilleries, but the distinctive flavour of the whiskey, due in part to the peat used in the drying kilns, has been an important factor in the development of the industry. Fishing is important in the east.

In this region there are several important coastal towns acting partly as agricultural centres and partly as fishing ports. Of these the chief is *Aberdeen* (situated at the mouth of the Dee), one of the leading fishing centres in the British Isles and which has, in addition, an important granite-export trade. *Inverness*, on Moray Firth at the head of the Caledonian Canal, and on the coastal plain route to the north of Scotland, is an important route centre.

Of the islands, the *Inner Hebrides* are tourist centres. The *Outer Hebrides* contain *Stornaway* (on Lewis-Harris Island), an important fishing port. Economic conditions are severe, however, for the soil is poor and in some parts boggy. Some cattle and sheep are reared, and the hardier cereals, oats and barley, are cultivated. The home weaving of the famous Harris tweeds provides occupation for those cottagers who are not engaged in the whisky distilleries or fisheries, and peat is the only fuel. In the *Orkneys* and *Shetlands* fishing is an important industry. Cattle, sheep and ponies are reared, while cottage woollen industries offer a supplementary source of income.

Central Lowlands

The physical features of this area are briefly described on page 413, and they are shown broadly on Fig. 166. The wetter climate of the western part of the region gives rise to cattle rearing and dairy-farming, whilst the drier east is engaged in sheep-rearing, wheat and fruit farming, the last named particularly in *Strathmore* and the *Carse of Gowrie*.

The Lowlands are the most important industrial region and the most densely populated area of Scotland. This is due in part to the fertile soil, but mainly to the large deposits of coal and formerly of iron in a district which has exceptional advantages for land and sea communications, as well as excellent harbour and shipbuilding facilities on the Clyde Estuary. The production of iron ore is now very small.

The coalfields of the Scottish Lowlands are four in number, *viz.*, (1) the Ayrshire coalfield; (2) the Lanarkshire coalfield; (3) the Fifeshire coalfield, and (4) the Midlothian coalfield.

THE AYRSHIRE FIELD has deposits of iron ore as well as coal, and consequently has developed an important iron and steel industry. The mining of local ore is now negligible, so that the industry depends on ore imported from Spain.

Kilmarnock, the chief town of the field, manufactures locomotives, rolling-stock and woollens, and is noted for the manufacture of carpets. Shipbuilding is carried on at *Ayr*, which, with *Ardrossan*, exports much coal to Northern Ireland. *Glengarnock* is the chief smelting centre.

THE LANARKSHIRE FIELD is the largest and most important of the

Scottish coalfields. As in the Ayrshire field, iron ore is found, though now in very small quantities, and there is a large iron and steel industry.

All the chief towns have important engineering and smelting works, but the principal centres are *Glasgow*, *Airdrie*, *Coatbridge*, *Motherwell*, *Hamilton* and *Falkirk*. Motherwell is famous for its steel roof and bridge work, and Glasgow, though carrying on engineering in all its branches, is specially noted for the manufacture of locomotives.

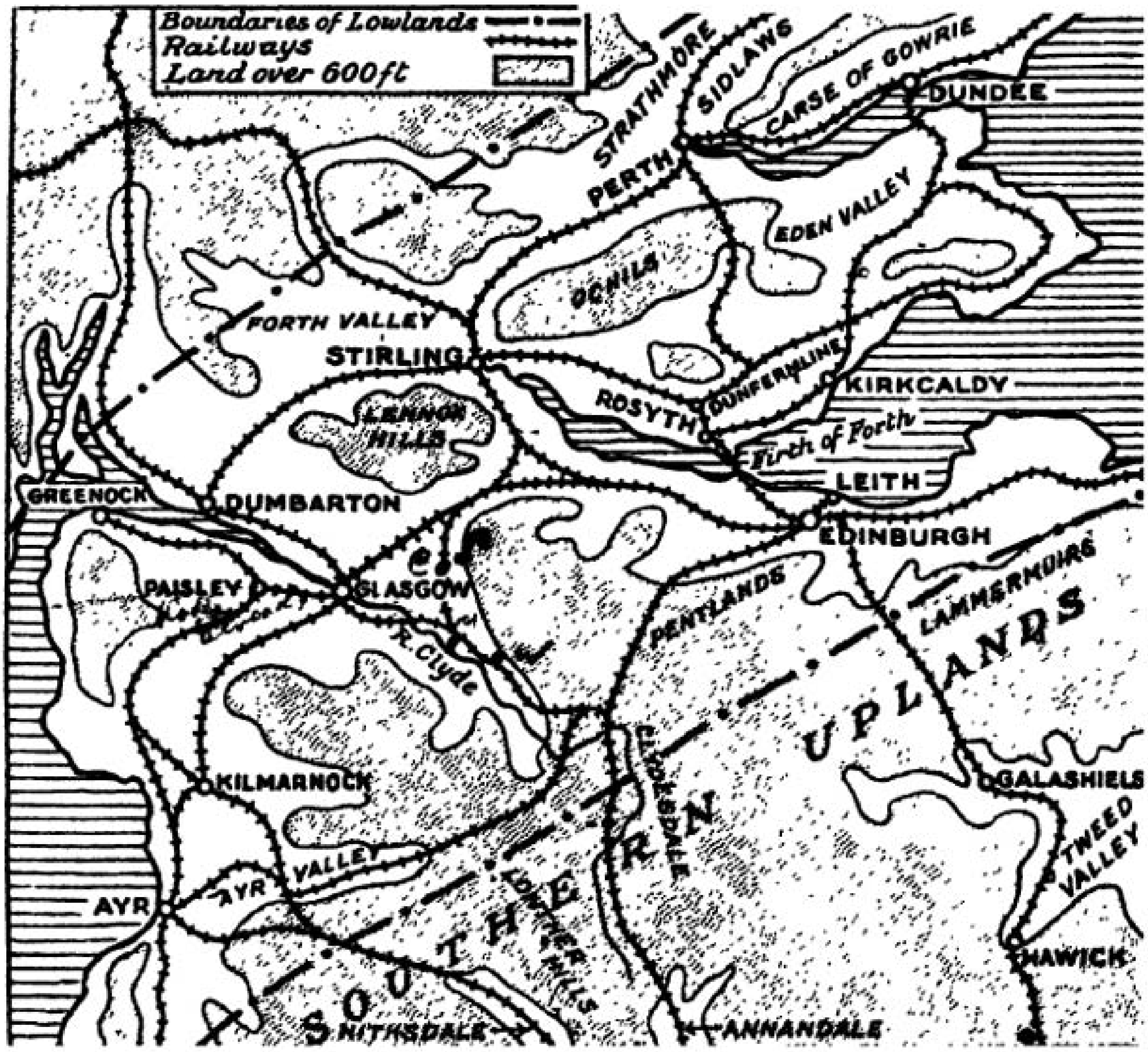


FIG. 166: ROUTES AND TOWNS OF THE CENTRAL LOWLANDS.

Shipbuilding is another great industry of this coalfield—indeed, the Lower Clyde is the greatest shipbuilding district in the world. All the towns along the Firth of Clyde are engaged in the industry, notably *Glasgow*, *Clydebank*, *Dumbarton*, *Port Glasgow* and *Greenock*.

The cotton industry is also important (see p. 429), while other industries of this field are sugar refining at Greenock, and the manufacture of pottery, chemicals and woollens at Glasgow. The great port of this region is Glasgow (*see* p. 214).

THE FIFESHIRE FIELD supports the linen, jute, and shipbuilding industries centred at *Dundee* on the Firth of Tay, *Dunfermline* and *Kirkcaldy* (see p. 430); the jam and marmalade manufactures of Dundee, which is also a fishing port; and the dyeing and bleaching works of *Perth*, which is an important route centre as it stands at the head of the Tay estuary, in the gap between the Ochils and the Sidlaws. Kirkcaldy is noted also for the manufacture of oilcloth and linoleum. Large quantities of coal are exported from *Grangemouth* and *Burntisland* while flax, linen yarn, timber and grain are imported.

THE MIDLOTHIAN FIELD, a small coalfield on the opposite side of the Firth of Forth in the county of Edinburgh, supplies both Edinburgh and Leith and the towns of the Tweed Valley.

Edinburgh, as the capital of Scotland and the seat of a University, has naturally developed a large printing and publishing trade. It manufactures paper and has also breweries, distilleries and linen mills. It is situated near the south shore of the Firth of Forth, a few miles from *Leith*, which acts as its port. The hinterland of Leith covers the whole of the Scottish Lowlands, and trade is carried on largely with the north European countries. The principal exports are coal, coke, fish, iron and steel goods, cottons and linens. The imports include sugar, grain, flour, dairy produce, flax, linen yarn, woollens and worsted yarn, iron ore and timber.

Southern Uplands

The Southern Uplands consist of a dissected plateau with plains only in the river valleys and along the coasts (see p. 414). There is much grassland, and sheep rearing is an important occupation which provides raw material for the Tweed woollen industry centred at *Hawick*, *Jedburgh*, *Galashiels*, *Kelso* and *Selkirk*. The higher parts are covered with poor grass and are unimportant. The south coastal plain is very fertile and provides excellent pasture for cattle, so that in all the river valleys and coastal plains agriculture and dairy farming are important. The only mineral of note is lead, which is found in the Lead Hills.

Dumfries, on the Nith, is a market town and a route centre. *Stranraer*, on Loch Ryan in the west, is an important packet station having steamer connections with Larne in Ireland.

Northern England

The main physical feature of Northern England is the Pennine Chain which would offer a serious obstacle to communications were it not for the fact that it is pierced by several river valleys. Along these pass the many roads and railways which serve this area, linking up the east with the west, and the north of England with the southern part of Scotland.

To the east of the Pennines lie the Yorkshire *Moors* and *Wolds*. Northern England may be sub-divided into regions comprising (1) the Plains, (2) the Lake District (including the Cumberland Coalfield), (3) the Lancashire and Cheshire Coalfield, (4) the Northumberland and Durham Coalfield and (5) the Yorkshire, Derbyshire and Nottinghamshire Coalfield.

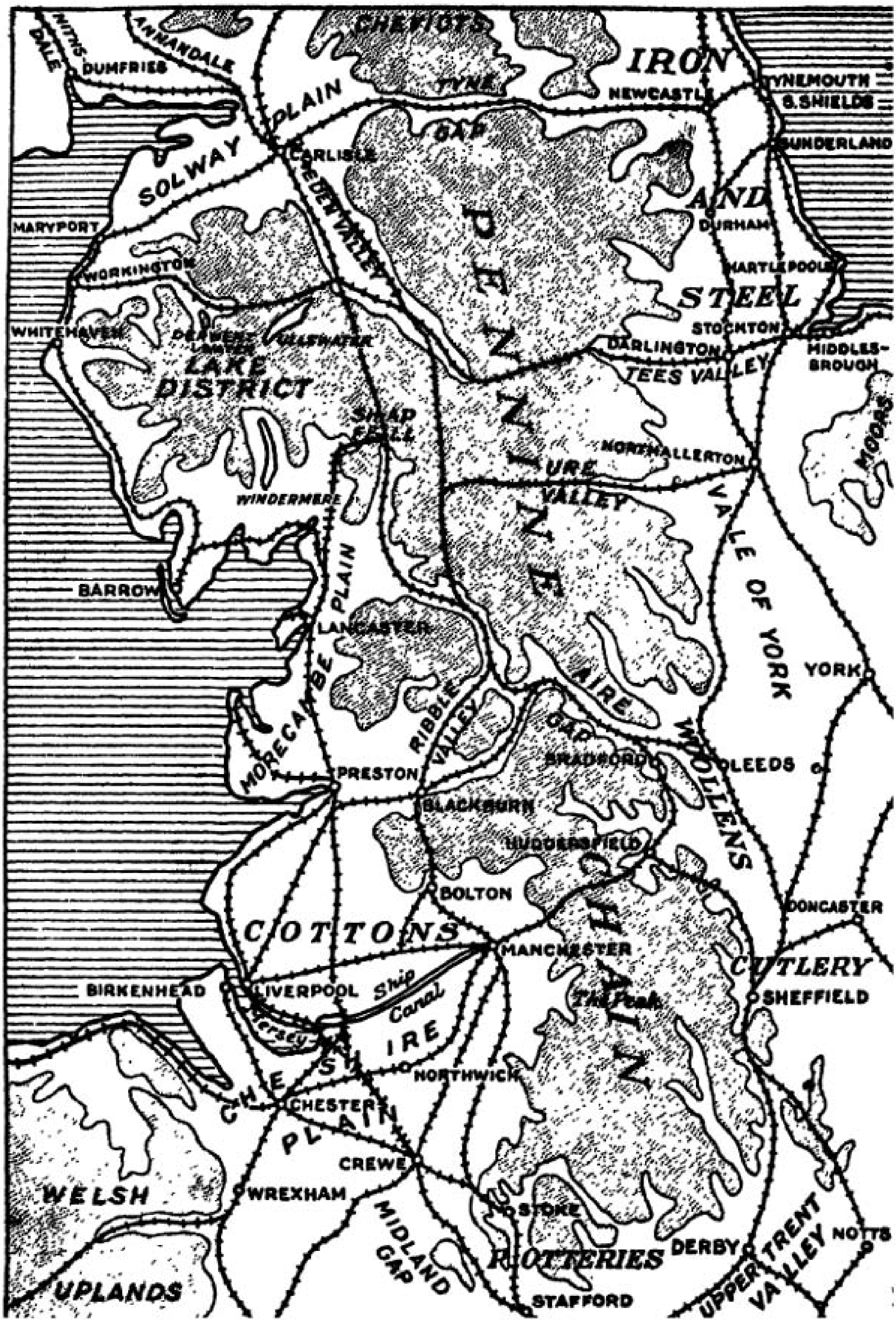


FIG. 167: ROUTES, GAPS AND INDUSTRIES OF NORTHERN ENGLAND.
(Land over 500 ft. dotted; "sleeper" lines indicate railways.)

Plains of Northern England

THE PLAIN OF PICKERING, drained by the *Derwent*, lies between the Moors and the Wolds, whilst the *Plain of Holderness* stretches south from the Wolds to Spurn Head. These two plains are arable and pastoral regions. Holderness is a horse-rearing centre and also grows cereals, principally wheat.

THE PLAIN OF YORK stretches from the Pennines on the west to the Moors and Wolds on the east, and from Northallerton in the north to the River Aire in the south. This plain is fertile, and, being on the leeward side of the Pennines, it is sufficiently dry for wheat. Barley, oats, root crops and flax are grown, and in the north and east horse-rearing is important. Pigs also are reared and dairy farming is practised. The region is well-watered and has excellent transport facilities by river, canal, rail and road.

York, the second ecclesiastical city of the Kingdom, is situated on the Ouse in a central position on the Plain and is a focus of road and rail routes from the north, south, east and west. It is thus a highly important market town and railway junction, with large railway repair shops. It manufactures flour, confectionery, especially chocolates (Rowntree, Terry), scientific instruments and beer.

The Lake District

This district, which includes Cumberland, Westmorland and the extreme north of Lancashire, is an area of dome-like volcanic rocks, furrowed by valleys radiating in all directions. In these valleys lie many beautiful lakes, the most important of which are *Windermere*, *Derwentwater*, *Bassenthwaite Water*, *Ullswater* and *Coniston*, and the tourist industry is of considerable importance, *e.g.*, at Keswick, Ambleside and Windermere.

THE LOWLAND AREAS comprise the narrow Coastal Plain, the Eden Valley in the north-east, the Solway Plain in the north-west and the Morecambe Plain in the south. THE UPLANDS have a heavy rainfall and are given over to sheep-rearing, which explains why Kendal still has a woollen industry. Dairying is important in the lowlands and valleys, where swedes, potatoes and oats also are grown, largely as winter food for the cattle and sheep.

THE CUMBERLAND COALFIELD, in the centre of the industrial part of this region, is a small field lying in the west between the Cumbrian Hills and the sea. Most of the coal is exported from *Whitehaven* and *Maryport*, but some of it supports a small iron industry at *Workington*. This field also supplies the coal for the important iron and steel industry of the Furness district of Lancashire, which lies 30 or 40 miles away to the south-east. Here the local supplies of rich iron ore (hæmatite) and the special advantages of the situation of *Barrow* have given rise to shipbuilding and the manufacture of armaments. The Furness ores are now little worked, West Cumberland having a much larger production, but the total output is insufficient and further supplies must be imported. Chemical industries also are developing at Barrow, due to the discovery of salt on Walney Island. Local supplies of plumbago gave rise to a pencil industry at *Keswick*, but the industry now depends on the importation of graphite from Ceylon, and deposits of salt have caused a chemical industry to develop at *Fleetwood*.

The routes across the Lake District are most easily understood by reference to railway and physical maps. *Carlisle*, on the Eden near the Solway Firth, is an important market town and route centre, commanding the west coast route to Scotland and also the western end of the Tyne Gap from Newcastle. Both branches of the L.M.S. Railway from London pass through Carlisle.

The Lancashire and Cheshire Coalfield

This lies to the west of the Pennines and supports the great cotton industry of Lancashire (see p. 428). Other industries include large engineering and electrical works making machinery for the cotton mills at such centres as Manchester, Salford, Oldham, Rochdale and Bolton; chemicals, in several towns, but principally at Widnes and St. Helens, where glass also is made; soap at Liverpool, Warrington, Port Sunlight and elsewhere; rayon at Manchester and Bolton; and woollen goods at Rochdale and Bury.

The great port of this region is *Liverpool* (see p. 213). *Manchester* has been made into a port for ocean-going steamers by the construction of the Manchester Ship Canal. It is the commercial and administrative centre of the cotton industry, and has an engineering industry.

Birkenhead, opposite Liverpool, may be considered as part of the latter port. It is an important manufacturing centre, and makes ships' requisites, tobacco, leather, soap (Port Sunlight) and jams. It also has important shipyards, notably those of Cammell Laird.

The Northumberland and Durham Coalfield

This coalfield supports important iron manufacturing and shipbuilding industries for coal, iron and flux occur in close proximity and further supplies of iron can be cheaply imported from abroad. Stockton and Darlington in the south are both important centres, and the iron industry of this region borders on the extremely important iron industry carried on round Middlesbrough, the chief centre of the smelting industry, with the support of coal brought from the Northumberland and Durham coalfield.

Important navigable rivers flow through the field: the *Tyne*, navigable for ocean-going vessels as far as Newcastle; the *Tees*, navigable as far as Stockton; and the *Wear* which, though useless for navigation, has a deep mouth providing facilities for shipbuilding at Sunderland.

Shipbuilding is of special importance on this coalfield, which has the necessary advantages—supplies of iron and coal found in close proximity near navigable and protected estuaries. The Tyne is lined with shipbuilding yards on both banks from its mouth at *Shields* (North and South) to *Elswick*, the whole district being appropriately known as

"Tyneside." *Newcastle* is the chief centre, while other important shipbuilding towns are *Sunderland*, *Hartlepool*, *Middlesbrough*, and *Stockton*. The iron industry is important for the supply of steel plated castings, forgings and machinery for the shipbuilding yards—particularly from the works of Middlesbrough and Consett—and for the manufacture of iron and steel goods of many other types. Of these the locomotives built at *Darlington* are of special importance.

Another considerable industry of this coalfield is the manufacture of *chemicals*, which is based on the plentiful supplies of salt available at Greatham at the mouth of the Tees. From Newcastle to Jarrow the south bank of the Tyne has numerous chemical works, manufacturing such products as washing soda, bleaching powder, hydrochloric acid and sulphuric acid, and there are similar works bordering the estuary of the Tees. *Billingham-on-Tees* is an important chemical centre, the latest development being the production of oil from coal.

Newcastle (see Fig. 168), in addition to being the leading centre of the shipbuilding and chemical industries of the region, manufactures guns and machinery. It exports large quantities of coal, mainly to London, as well as iron and steel goods, ships, glass and chemicals. Its imports are mainly foodstuffs, iron ore and pit props.

It has good rail connections southwards to Durham and Yorkshire; northwards along the plain to Berwick and Scotland; eastwards to the coast at Sunderland, and westwards through the Tyne gap to Carlisle.

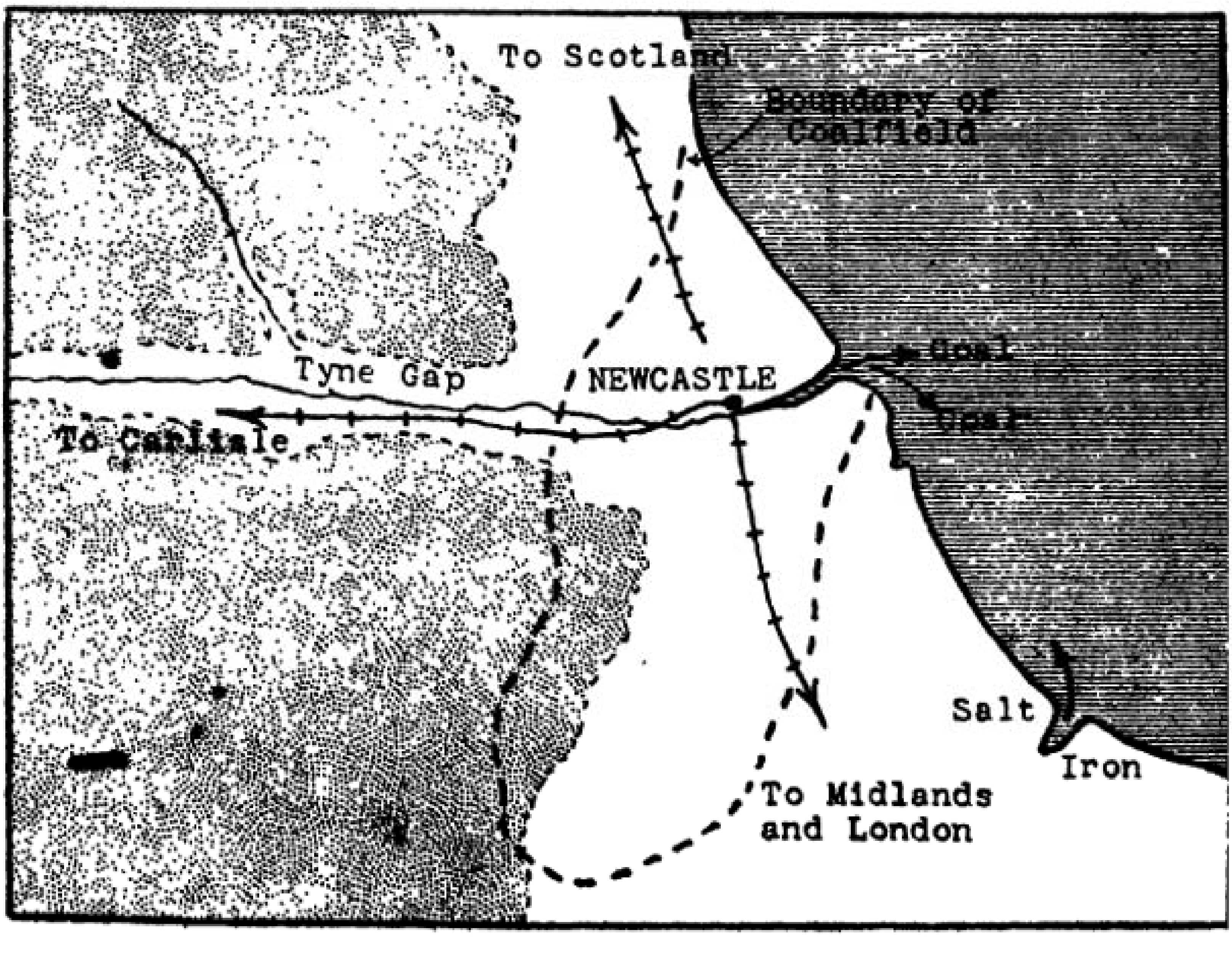


FIG. 168: THE POSITION OF NEWCASTLE.
(Upland areas dotted.)

Middlesbrough, on the Tees estuary, is the most important of the Tees ports, and is the centre of the great iron industry based originally on the ore of the Jurassic Ridge. Now much iron ore has to be imported to provide raw material for the iron and steel goods (girders and constructional iron generally) and ships which comprise Middlesbrough's principal exports.

Sunderland, south of the Tyne estuary, exports coal and ships, and *Blyth*, north of the Tyne, is an important coal port.

The York, Derby and Nottingham Coalfield

This coalfield is very extensive, reaching from Leeds and Bradford in the north to Nottingham in the south. It supports a variety of industries, but the most important are those connected with wool (*see* p. 429) and iron.

The iron industry is of great importance and is allied with a large engineering industry. Machinery for the woollen and other industries is made in several towns, of which *Leeds*, *Halifax* and *Keighley* (making spinning and weaving machines) are the chief. Rolling-stock and pit requisites are made at *Leeds*, *Rotherham*, *Doncaster* and *Sheffield*.

Sheffield, on the river Don near the eastern foot of the Pennines, is one of the most famous centres in the world for the manufacture of cutlery, the industry having originated there because of the local supplies of wood and iron, and of grindstones from the millstone grit of the Pennines. Coal has since usurped wood as the power source and the best cutlery is now made from Swedish iron. In addition to cutlery and pit machinery, Sheffield manufactures high-class steel for the building of war vessels and is important for the production of electro-plated goods.

Doncaster, also on the river Don to the north-east of Sheffield, is a railway junction and has important railway works. *Derby*, at the southern end of the Pennines on the Derwent, a tributary of the Trent, is a railway centre, and has railway, motor-car, aeroplane, silk and china works. *Bradford*, situated on the south-east of the Aire gap, besides its woollen manufactures (see above) makes silks, plushes and velvets ; *Leeds*, on the Aire at the eastern end of the gap, manufactures boots, shoes and chemicals, and has an extensive iron industry which produces locomotives, printing machines, weaving machines, etc. ; *Barnsley*, lying between Sheffield and Leeds, makes linen ; while *Castleford*, on the Aire east of Leeds, and *Mexborough*, near Sheffield, have extensive glass-works. *Nottingham*, on the Trent to the south-east of the Pennines, manufactures leather goods, lace and hosiery (cotton), and is a railway centre.

Hull, on the River Hull, which runs into the Humber, is the principal port of the region. It has a productive hinterland and excellent communications in all directions. The exports include coal, woollens, cottons, iron goods, steel goods, pottery, lace, hosiery, paints and varnishes. The Humber estuary faces the estuaries of the Elbe and the Weser as well as the Skagerrack, and through these from the countries of northern Europe come many of Hull's imports, which include grain, timber, pit-props, flax, hemp, soya beans, dairy produce and beet sugar.

The industries on the banks of the Humber, centring round Hull, include flour-milling and the manufacture of soap, margarine, sauce, cattle cake, paints, varnishes, wall paper and confectionery. Hull has the second greatest oil-seed industry in the world, and is also an important fishing port, being within easy reach of the Dogger Bank.

Grimsby, on the south bank of the Humber estuary, has a poor hinterland, but is an important fishing port. *Goole*, at the head of the Humber estuary, is a rapidly developing port, exporting coal, stone, woollens and machinery; and importing indigo, butter, fruit, timber, and wool. *Immingham*, north-west of Grimsby, has a fine harbour. It is a comparatively new port, entirely controlled by the L.N.E.R., which has equipped it with docks specially designed to deal with the coal, timber, wool and grain trades.

The Cheshire Plain

The Cheshire Plain lies west of the Pennines and south of the Lancashire and Cheshire coalfield. The rainfall is good and the climate equable, so that agriculture (including market gardening and the growing of oats and potatoes) and cattle rearing, with a consequent dairying industry, are both important. Salt from *Middlewich* and *Northwich* has given rise to the manufacture of glass and chemicals especially at *Runcorn* (Imperial Chemicals, Ltd.) and Northwich, while silk goods are made at *Macclesfield*, and rayon at *Queensferry* (Courtaulds).

There are many important routes across the plain, both *Chester*, in the west, and *Crewe*, in the south-east, being noted railway centres. Crewe, in particular, has large railway workshops belonging to the London, Midland and Scottish Railway.

Other notable features are the Birmingham Canal and the Trent and Mersey Canal to which reference has previously been made.

The Severn Basin

The Severn Basin is formed by the valleys of the river Severn and its tributaries, notably the Warwick Avon. In this region also may be included those rivers which flow into the Severn estuary, such as the *Bristol Avon* and the *Wye*. The region is largely agricultural and pastoral, while the large quantities of apples and pears grown in the counties of Monmouth, Gloucester and Hereford are the bases of the well-known West of England cider and perry industry. The Basin has also a large variety of manufactures.

The principal pastoral and agricultural regions are the middle and lower Severn and the Avon valleys. In the last named valley is the *Vale of Evesham*, lying between the Clent Hills and the Edge Hills, noted for its orchards and market gardens, centred round *Evesham*. *Worcester*, on the Severn near its confluence with the Teme, is a route centre with a fine cathedral, and manufactures gloves, Worcester china and tins for the canning industry. *Kidderminster*, on the Stour, a tributary of the Severn, is a well-known carpet manufacturing centre. *Shrewsbury*, on the upper Severn north of the South Shropshire Hills, and in the centre of the Shropshire plain, is a railway junction and market town. *Gloucester*, at the lowest bridging point of the Severn, is a route centre and cathedral city with numerous miscellaneous industries. *Coventry*, in the valley of the Warwick Avon, is noted for the manufacture of motor-cars, cycles and artificial silk.

THE PLAIN OF HEREFORD in the south-west is a sheltered cattle-rearing, dairy-farming, fruit-growing and hop-growing region. *Hereford*, on the Wye, and *Ludlow*, on the Teme, are route towns, while *Malvern* at the foot of the *Malvern Hills*, is an inland health resort. *Bath*, on the Bristol Avon, is famous for its warm springs.

THE BRISTOL COALFIELD. Wool from the sheep reared on the Cotswolds and coal from the Bristol Coalfield gave rise to the West Country woollen industry (see p. 430). This coalfield lies between the Cotswolds and the town and port of *Bristol*, on the Bristol Avon. Bristol has tobacco, cigarette, cocoa, chocolate, chemical and sugar industries, based largely on imports from the Americas and the West Indies. Its outport is *Avonmouth*, but its development has been restricted because of its thinly peopled and industrially limited hinterland. In addition to the raw materials for its industries, Bristol imports grain, provisions and bananas, while it exports coal, iron and steel goods, oil and chemicals.

THE FOREST OF DEAN COALFIELD, lying between the Severn and its tributary the Wye, is really an outlier of the South Wales field. It has no important industries.

THE MID-SEVERN COALFIELDS, lying at intervals along the course of the Severn, are now of little importance.

The Upper Trent Basin (The Midlands)

THE MIDLAND PLAIN, drained by the upper Trent, which flows north-eastwards to the Humber, is an agricultural region interspersed with small coalfields. The principal agricultural area flourishes on the alluvium deposits of the River Trent, where potatoes and root-crops are grown in large quantities, and where, owing to the drier climate, wheat is an important crop. In other districts dairying is important, *Stilton* cheeses and the pork-pies of *Melton Mowbray*, in north-east Leicestershire, being well known.

THE NORTH STAFFORDSHIRE COALFIELD, a continuation of the Lancashire and Cheshire coalfield, extends from the north of the county almost as far south as Stafford. The basis of activity on this field is the pottery industry (*see* p. 433). *Stafford*, south of the potteries on a tributary of the Trent, is the centre of a rich pastoral area which supports large herds of cattle, the hides from which give rise to the manufacture of boots, shoes and saddlery. Stafford has also a rapidly growing industry manufacturing cables and electrical apparatus.

THE SOUTH STAFFORDSHIRE COALFIELD, extending southwards from near Stafford for a distance of some twenty miles, possessed rich deposits of iron ore and partly supports the varied industries of the *Black Country*. Until recently, the manufactures of this region consisted mainly of hardware, but there have been considerable changes, the manufacture of jewellery, nails, small arms, hollow-ware and similar products having in many cases given way to " new " industries which have developed and overshadowed the " older " industries. Nowadays, foremost among the chief manufactures of the region are motor-cars, electrical goods, bicycles, food, drink and artificial silk. A large number of the manufacturing towns of the region still specialise in particular articles and, because of inland situation, they still produce goods of relatively high value and small bulk or those which can be readily conveyed to the market, *e.g.*, motor-cars.

Birmingham, lying east of the Clent Hills in the Thame valley, is the chief town of the region and a railway centre. It is situated just off the coalfield, and is famous for small arms, brassware, pressed steel goods, motor cars, cycles and engines.

Dudley, west of the Clent Hills, and *Wolverhampton* have become manufacturers of rayon and ready-made clothing ; *Redditch* has turned to springs for motor-cars and hooks for hosiery ; whilst *Walsall* has almost given up the manufacture of saddlery and now makes light leather goods and furnishings for motor-cars—a clear sign of changes in methods of transport.

THE WARWICKSHIRE COALFIELD, much smaller and less important, lies to the east between the rivers *Thame* and *Anker*. There are no important towns on the field, much of the coal being sent to other parts of the country.

THE LEICESTERSHIRE COALFIELD lies to the north-east of the Warwickshire field, and like that field is lacking in iron ore and has no hardware industries. *Leicester*, situated on the Soar, a tributary of the Trent, and near but not actually on the coalfield, is noted for the manufacture of woollen hosiery, boots and shoes.

Burton-on-Trent, a few miles north-west of the coalfield, is famous for its brewing industry, which became important because of the gypsum contained in the local water, and because of the proximity of the barley fields of the Midlands and the hops of Hereford. Suitable water is now made chemically, and hops are obtained from abroad, but the excellent transport facilities by road, rail and water to all parts of the country and the fame of the Burton brews have enabled the industry to persist.

South-Eastern England (The Scarplands)

This region stretches from the estuary of the Humber in the north to the south coast, and from the Midland Plain, the Severn Basin and the Devon and Cornwall Peninsula in the west to the east coast. It is entirely an agricultural region, with the exception of the London area and the newly opened Kent coalfield. Physically, the land consists of bold escarpments alternating with lower land from which the softer rocks have been weathered away. The escarpments, details of which have been given in Chapter 24, form hills of limestone and chalk, with steep slopes to the west or north-west and more gentle slopes to the east or south-east.

The whole of this area is frequently referred to as the "scarplands," and is sub-divided regionally into the Wash Basin, East Anglia, the Thames Basin, the Weald and the Hampshire Basin.

THE WASH BASIN, or the *Fens*, consists of the low-lying land north and south of the *Wash*—a wide opening in the coast formed by subsidence and erosion. Formerly marsh land, much of the area has been drained, and large crops of wheat, sugar-beet, potatoes, barley, oats and fruits are obtained. The more extreme type of climate, with its dry, warm summers, allied with the clayey soil and the even lie of the land, are factors which have made this region particularly favourable to the cultivation of wheat. Cattle and sheep also are reared.

Manufactures are few, and those which exist are based on the agricultural and pastoral occupations, *e.g.*, agricultural machinery at *Peterborough* (on the river Nene in north-east Northamptonshire), *Bedford* (on the Ouse), and Lincoln; boots and shoes at *Northampton* (the principal English centre) which lies on the upper Nene north-east of Bedford, and *Kettering*, situated north of Northampton. Peterborough is also the principal English brick-making centre. *Cambridge* on the Cam, is a famous university town. *Lincoln*, in the north on the river Witham, is a cathedral city, and makes bricks and agricultural machinery. *Newark*, north-east of Nottingham on a small navigable tributary of the Trent, and *Gainsborough*, on the Trent in north-west Lincolnshire, are market centres. *Frodingham* and *Scunthorpe* have become important for the manufacture of steel.

EAST ANGLIA is that part of eastern England between the Thames estuary and the Wash which embraces the counties of Norfolk and Suffolk and part of Essex. The climatic conditions—more continental in type than in any other part of Britain—together with the presence of large areas of boulder clay and the level character of the surface make this the principal wheat producing area of Britain. Other crops include sugar-beet, potatoes, strawberries and other market garden produce, whilst on the poorer sandy soils quantities of barley are grown.

Norwich, in the east near the river Yare, is the most important town. It manufactures agricultural implements, aircraft, boots, shoes, mustard and starch. *Ipswich*, at the head of the estuary of the River Orwell. makes agricultural machinery and is a wheat market. *Harwich*, at the mouth of the Stour estuary, is an important packet station for the Hook of Holland, Antwerp and Hamburg. *Yarmouth*, near the mouth of the Yare, and *Lowestoft*, at the mouth of the river Waveney, are holiday resorts and fishing ports, being noted especially for herrings.

THE THAMES BASIN includes the valleys of the River *Thames*, and of its many tributaries, notably the Ock, the Kennet, the Wey, and the Mole on the right bank, and the Windrush, Cherwell, Thame, Colne, Lea and Roding on the left bank. Below the *Goring* Gap, where the river flows between the Chiltern Hills and the Marlborough Downs, the Thames valley is known as the *London Basin*. The chalk downs on both sides of the river support flocks of sheep, while the river valleys and wetter areas support cattle, giving rise to a dairying industry in such places as *Devizes*, in the west in Wiltshire, and *Aylesbury*, in the Thame valley in the north. In the drier areas, wheat, root crops, barley, oats and market gardening produce are grown and sent to London.

High Wycombe, a gap town in the Chilterns, has a chair-making industry based on the beech trees of the Chilterns. *Reading*, on the Thames south of the Chilterns, is a railway junction, and has brewing and biscuit industries. *Luton*, a gap town near the source of the Lea, is famous for its straw hat industry, but this industry has declined of recent years and other manufactures, including engineering, motor-cars, dyeing and chocolate, have been established with success. *Swindon*, on the northern slopes of the Marlborough Downs, is the headquarters of the G.W.R. engineering works. *Oxford*, in the upper Thames valley, is a railway centre and university town with many famous colleges. *Cowley*, nearby, is the headquarters of the world famous Morris Motors Ltd.

The whole of this region is dominated by *London*, the political and commercial capital of Britain, wonderfully situated on the broad Thames at the lowest point at which it could be bridged (*see* p. 210). From London, railways and roads radiate to all parts of Great Britain, crossing the hills which enclose the London basin on the north and south by means of natural gaps, as shown in Fig. 169.

THE WEALD includes the greater part of Kent, Surrey and Sussex in the extreme south-east of England, being bounded on three sides by the chalk ridges of the North and South Downs and on the east by the sea. The downs provide pasture for large numbers of sheep, whilst the "horseshoe" of the Weald proper produces hops (particularly in Kent), root crops, wheat, fruit and dairy produce for the London market. Iron is present and the development of the recently opened *Kent Coalfield* may in the near future convert this area into an industrial region.

As in the case of the towns in the Thames Basin, many of the towns of the Weald owe their existence or importance to London. Thus, holiday resorts such as *Brighton*, *Eastbourne*, *Hastings* and *Folkestone* on the south coast, and *Herne Bay*, *Margate* and *Ramsgate*, in north-east Kent, cater largely for the Londoner on holiday, while *Dover* (a naval base), *Folkestone* and *Newhaven* are packet stations dealing with the cross-channel traffic from the London area to Calais, Boulogne and Dieppe respectively. *Canterbury*, on the Stour in the east, is the ecclesiastical centre of England, and *Tunbridge Wells*, in the Medway valley, is an inland resort.

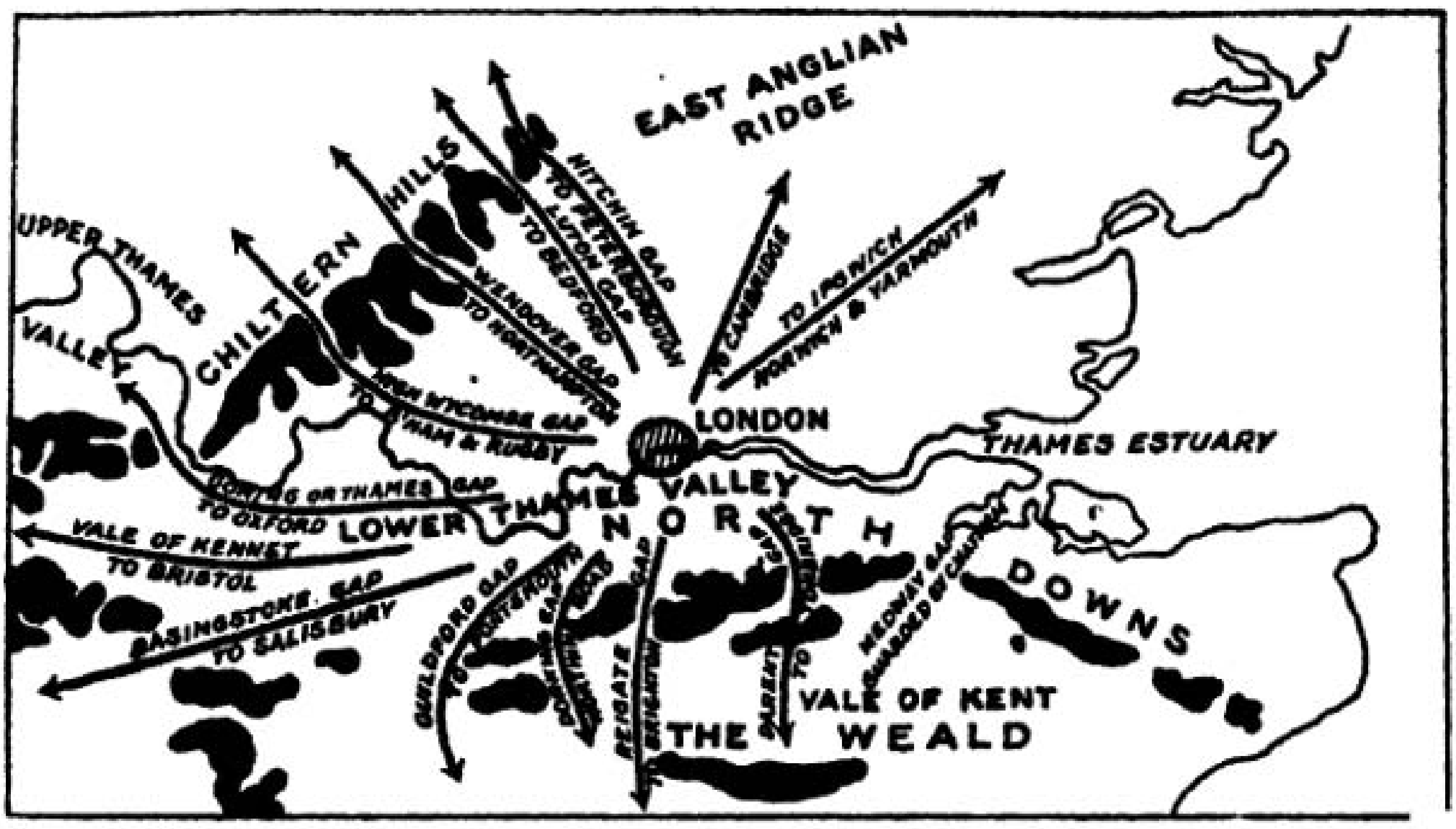

EAST ANGLIAN RIDGE
UPPER THAMES VALLEY
CHILTERN HILLS
HITCHIN GAP TO PETERBOROUGH
LUTON GAP TO BEDFORD
WENDOVER GAP TO NORTHAMPTON
HIGH WYCOMBE GAP
& RUGBY
TO CAMBRIDGE
TO IPSWICH NORWICH & YARMOUTH
LONDON
THAMES ESTUARY
GORING OR THAMES GAP TO OXFORD
LOWER THAMES VALLEY
VALE OF KENNET TO BRISTOL
BASINGSTOKE GAP TO SALISBURY
GUILDFORD GAP TO PORTSMOUTH
REIGATE GAP TO BRIGHTON
NORTH DOWNS
MEDWAY GAP GUARDED BY CHATHAM
VALE OF KENT
THE WEALD

FIG. 169: GAPS UTILISED BY THE ROUTES RADIATING FROM LONDON.

(Upland areas in black.)

THE HAMPSHIRE BASIN, surrounded by chalk hills, is filled with clay and sand. It stretches south from Salisbury Plain to the sea and eastwards from the Dorset Heights to the South Downs, and includes the *Isle of Wight*. Some areas are unproductive, but in others dairy produce, wheat, fruit and root-crops are obtained. The *New Forest*, west of Southampton Water, has a pony and pig-rearing industry. The Isle of Wight is a favourite holiday resort, as also are *Bournemouth* and *Swanage* in the west, the last-named being well-known, in addition, for its building stone industry. *Salisbury Plain*, west of the upper Avon, is a military training centre, to the south of which, on the Avon, is its chief town, *Salisbury*, a cathedral city and agricultural centre. *Weymouth*, near Portland Bill, is a holiday resort and a packet station for the Channel Isles. *Southampton* (*see* Chapter 16) is an important port, and *Portsmouth*, on Spithead, is Britain's chief naval dockyard.

Devon and Cornwall Peninsula

The Peninsula of Devon and Cornwall stretches from the Mendip Hills and the Dorset Downs south-west to Land's End, between the Bristol Channel and the English Channel. In addition to Devon and Cornwall, it includes parts of Somerset and Dorset. The region consists of high ground broken into masses, with surface rocks of red sandstone, limestone, granite and slate. In the north-east are the *Mendip Hills*, separating the *Plain of Somerset* from the Severn Basin. These hills contain the famous *Cheddar Gorge.*

West of the Somerset Plain are *Exmoor*, a series of steep hills and valleys bordered by wooded glens, and the *Blackdown Hills*, both of which fall to the *Plain of Devon*, drained by the rivers *Exe* and *Taw.*

South of the plain lies *Dartmoor*, a tableland of granite, and this is separated from the lower *Bodmin Moor* (also of granite) in the west by the *Tamar Valley.*

The remainder of the peninsula is lower, and juts out south-westward into the sea, ending in *Land's End* and the *Lizard.* The *Scilly Isles*, a group of about 150 granite islands lying some twenty-five miles out to sea, are an extension of the peninsula, whilst the volcanic *Lundy Island*, off the north-west coast, is an extension of Exmoor.

Although a large part of the region is moorland and hill, growing only rough pasture, the lower areas are fertile. These latter areas. and especially the Plain of Devon and the Tamar Valley, have good pasture land and extensive orchards which produce quantities of dairy produce and fruit (Cheddar cheese, Devonshire cream and cider). The warmer climate of southern Cornwall and the Scilly Islands (five only of which are inhabited) is very favourable for the cultivation of early vegetables and flowers which, because of the high prices obtained, are despatched quite long distances to London and other towns.

Tin and copper mining were at one time important in Cornwall, but the copper mines are almost exhausted and tin mining (Truro and St. Austell) is now of comparatively small importance. The granite of Dartmoor is famous, as also is china clay or kaolin, which is quarried in large quantities in east Cornwall and west Devon and is sent from the small port of Fowey to the Potteries by sea to the Mersey and thence by the Mersey and the Trent and Mersey Canal.

There are numerous good harbours and consequently fishing (pilchards and mackerel) is an important industry at such places as *Penzance, St. Ives, Falmouth* and *Tor Bay.* Other coast towns, *e.g., Torquay* in the east, *Newquay* and *Bude* in the west, and *Ilfracombe* and *Lynton* on the Bristol Channel, have become large and prosperous holiday resorts owing to the mild climate and the fine scenery in the vicinity.

The most important town of the region is *Plymouth*, situated on Plymouth Sound on the south coast, which is an important naval station, naval dockyard and mail port. *Devonport*, nearby, also is a naval dockyard. *Falmouth*, on the Fal estuary west of Plymouth, is a shipping and trawl-fishing port. *Penzance*, near Land's End, is the terminus of the G.W.R. railway and the port of the Scilly Isles. *Truro* lies on the Truro, a branch of the river Fal, and has steamer connection with the sea. It has pottery and clothing industries, is a market town, and is the junction where the railway to Land's End branches southwards to Falmouth. *Exeter*, at the head of the Exe estuary, is the county town of Devon and a route centre. *Taunton*, on the river Tone, is the centre for the dairying and fruit farming region of the Vale of Taunton, between the Quantock and the Blackdown Hills, and also is a route centre.

The Channel Islands and the Isle of Man

THE CHANNEL ISLANDS, the most important of which are *Jersey*, *Guernsey*, *Alderney* and *Sark*, lie near the French coast and physically form part of France. The islands belong to Britain but are almost entirely self-governing. The mild, wet climate is suitable for cattle-rearing and dairy-farming. These industries, together with the tourist industry and the production of early vegetables (potatoes), tomatoes and flowers for the English market, are important. The principal towns are *St. Helier* in Jersey and *St. Peter's Port* in Guernsey.

THE ISLE OF MAN is situated in the Irish Sea between England and Ireland and, like the Channel Isles, is self-governing. Fishing, lead mining and stock-raising are carried on, but the principal occupation is the tourist industry, of which *Douglas*, on the east coast, is the centre.

Wales

The relief of Wales is referred to on p. 414. The few inhabitants of the uplands are engaged primarily in sheep rearing, but in the *Snowdon* region in the north (around Llanberis and Bethesda) slate quarrying is important. Cattle-rearing and dairy-farming are confined to the plains, where also barley, oats and root crops are cultivated, but not to any great extent. On the whole, farming occupations are not important and, broadly, the economic importance of the country is confined to (1) its holiday resorts, (2) its water supplies, which have resulted in large municipalities (*e.g.*, Birmingham) building extensive reservoirs to ensure a sufficient supply of pure water, and (3), by far the most important, its southern coalfield.

THE SOUTH WALES COALFIELD extends across the whole of north Glamorganshire into Monmouthshire on the east and Carmarthenshire on the west, and has an extension westwards in the Pembrokeshire field. The main field actually reaches the coast only along the Swansea and Carmarthen Bays, but nowhere is it far from the sea, and the valleys of the numerous streams flowing south to the Bristol Channel provide ready means of access to the heart of the coalfield from the great ports of the region. Bituminous coal is obtained in the east, steam coal in the central area and anthracite in the west.

The excellent quality of the coal and the favourable position of the field in close proximity to the good harbours made this coalfield the greatest coal-exporting region in the world. Both South America and the countries of the Mediterranean are singularly lacking in coal, and South Wales is in an excellent position to satisfy their requirements.

The coalfield is also the site of great metal industries. Iron ore, obtained chiefly from northern Spain, is smelted at many places, notably at *Newport*, *Merthyr Tydfil*, *Tredegar* and *Dowlais*. The industry became localised originally because of the presence of iron, timber supplies and abundant water-power, and it remains largely because of geographical inertia. Tin, imported in ingots and bars from Malaya and as ore mainly from Bolivia and Nigeria, is the basis of an important tin smelting and tin plate industry at *Swansea* and the surrounding district. Copper, silver, nickel, lead and zinc also are smelted in this neighbourhood. Copper smelting originated because the Swansea Bay area was formerly densely forested. When coal replaced timber as a fuel, the acquired skill of the workers and cheap fuel at tidal water not only further established copper smelting but also attracted nickel, tin-plate, zinc and similar smelting industries. Patent fuel is made from small coal and coal dust and the pitch and slag of the iron industry are made into tarmac. Other industries include the manufacture of portland cement, wire ropes and wagons ; ship-breaking and ship-repairing.

Cardiff, at the mouth of the River Taff and at the converging point of narrow valleys which provide easy access to the coalfield, is the greatest coal port in the world. Its import trade is less important, consisting largely of foodstuffs, iron ore and timber, though it has large flour-milling industries based on imported wheat. Communication with London is made *via* the Severn Tunnel.

Newport, at the mouth of the Usk, the deepest tidal river with floating docks in the British Isles, is a coal port and is becoming a serious rival to Cardiff.

Swansea, situated on Swansea Bay, west of Cardiff, also is a coal port, but it is more important as the centre of the South Wales metal industries, producing a large proportion of the British output of tin-plate, its principal manufacture. Swansea's imports include tin, copper, silver, lead, nickel and iron. Its principal exports are tin-plate, coal, patent fuel, coke, copper, zinc and iron and steel goods.

THE NORTH WALES COALFIELD, extending with intervals from north Flintshire into Shropshire, is nothing like as important as that of South Wales. The coal is used mainly to meet the domestic and industrial requirements of Cheshire and North Wales. Some is used to smelt iron ore at Wrexham and Mostyn and for various small industries around Flint, on the west of the Dee estuary. Artificial silk is manufactured at Queensferry, whilst Flint has artificial silk and chemical industries. In other areas, *e.g.*, Carnarvon, slate is quarried.

Northern Ireland

Northern Ireland forms part of the United Kingdom, and includes the counties of Antrim, Down, Armagh, Fermanagh, Tyrone and

Londonderry. In the north-west are the *Sperrin Mountains*, in the north-east the *Antrim Plateau* and in the south-east the *Mourne Mountains*. South of the Antrim Plateau is *Lough Neagh*, the largest lake in the United Kingdom. The lowlands around Lough Neagh, and the valleys of the rivers *Foyle* and *Bann* in the north and the *Lagan* in the east are fertile, the principal occupations being the cultivation of oats and flax, dairy-farming and pig-rearing.

Northern Ireland is much the most important industrial region of Ireland, the industries being carried on mainly in the north-east, where coal can be most easily obtained by sea from the Ayrshire and Cumberland coalfields of Scotland and England respectively. The linen industry, supported chiefly by fibre imported from the Baltic countries, is highly important, Irish linen being world-renowned for its fine quality. The main factors influencing the localisation of the linen industry were (1) the production of home-grown flax (but this is now very small), (2) the presence of pure water for bleaching and washing, (3) the moist climate, (4) the availability of cheap labour, (5) the proximity of the Scottish coalfields and machinery industry, and (6) the employment of Scottish skill and organising ability. The building of ships also is important, despite the fact that the country lacks adequate supplies of coal and iron, the main factors influencing the development of the industry being (1) efficiency of the workers, (2) good launching and building facilities, (3) the low cost of land, and (4) proximity to the coal and steel centres of Ayrshire and Cumberland.

Belfast, on the river Lagan at the head of Belfast Lough, is the centre of this industrial region. In addition to its linen industry, it is the most important ship-building centre, the main supplies of coal, iron and steel being at present obtained from the Ayrshire coalfield. Both iron ore and aluminium ore are found in Antrim, but neither is smelted locally; the iron ore is sent to Ayrshire and the aluminium ore to the works at Foyers and Kinlochleven in Scotland. There are also engineering, tobacco, rope-making and distilling industries. *Londonderry*, on the Foyle, in the north-east, is a port and a route centre with linen, bacon curing, milling, biscuit and shipbuilding industries. *Lisburn*, also, makes linen.

Irish Free State

The Irish Free State, consisting of the remaining areas of Ireland, became a self-governing Dominion of the British Empire in 1922. It may conveniently be divided into (1) the Central Plain; (2) Western Connaught and Donegal and (3) Southern Ireland.

THE CENTRAL PLAIN covers one-third of the total area. It is a limestone area, covered with boulder clay due to glacial action. There are numerous lakes and bogs (*e.g.*, Loughs *Derg* and *Ree*, and the *Bog of Allen*), while the plain is drained by numerous rivers, the most important being the *Shannon* (*see* p. 417), the longest river in the British Isles, the *Boyne* and the *Liffey*.

The principal occupation on the Central Plain is the rearing of cattle and pigs, large quantities of live cattle and dairy produce being exported. Potatoes are extensively cultivated, while oats and barley are grown.

Dublin, at the mouth of the Liffey, is the capital and the port from which produce is shipped to Britain. It has good rail and canal connections with the whole of Ireland, and has convenient access to the populated districts of Northern England and the English Midlands. There are important brewing, distilling and poplin manufactures in the city. Its outport is *Kingstown*, a mail port with steamer routes to Holyhead.

Limerick, the port for Western Ireland, stands at the head of the Shannon estuary. It has a fertile hinterland, including the pastoral *Golden Vale*, which supports various industries, notably bacon-curing and tanning. Limerick exports cattle, bacon, hides and dairy produce to Britain. The falls of the Shannon at Ardnacrusha, near Killaloe, have been harnessed to provide electricity for the whole of the Free State.

WESTERN CONNAUGHT AND DONEGAL is the mountainous, wet and wind-swept area in the north-west of the Free State. It is relatively unimportant, although cattle and pigs are reared and fishing is practised, whilst the fine scenery of the coast is attracting tourists in increasing numbers.

SOUTHERN IRELAND is composed in the west of east-west mountain ridges and valleys, in one of which are the beautiful *Lakes of Killarney*. Seaward some of the valleys have been drowned to form *rias*. Off the south-west coast are *Valentia Island*, an important cable station, and *Clear Island*, an important lighthouse and signalling station. The eastern part of Southern Ireland is composed of sedimentary rocks interspersed with fertile valleys. The highest part is in the *Wicklow Mountains*, a granite mass lying south of Dublin.

The equable, wet climate of south-western Ireland is particularly favourable to the growth of grass, so that dairy-farming and pig-rearing are important occupations. Fishing and catering for tourists also are important. The drier eastern area is more favourable to agriculture, and barley (supporting brewing industries at Waterford and Kilkenny) and wheat are grown.

Cork, on the south coast, has a fine harbour and is the principal town. It has bacon-curing and milk-condensing industries, and exports live cattle and large quantities of eggs, cheese and butter to Britain. *Queenstown* (*Cobh*), on an island in Cork Harbour, is a mail and passenger port for Atlantic liners. *Waterford*, in the south-east, has a splendid harbour, and *Rosslare*, in the south-east corner, is a packet station having steamer connection with Fishguard, on the Great Western Railway route from London to Ireland. A little coal is mined near *Kilkenny*.

DISTRIBUTION OF POPULATION

Until the Industrial Revolution, when steam power generated from coal changed all the conditions of manufacture, the south-eastern counties of England, grouped radially round London, were the most populous parts of the British Isles, and the market towns of this region were the main centres of concentration. This is what we should expect, for here, in the south-east, were the most fertile parts of the country, and as, in the days before the Industrial Revolution, people tended to live where food was most easily grown and obtained, this area supported a greater population than any other part. Further, such industries as there were—and even before the Industrial Revolution, England was already famous for her manufactures, particularly her woollens—relied for their power on the water of streams and rivers and so were independent of coal. Moreover, the charcoal of the Weald was long used for smelting purposes in the iron industry of England—the industry, which, it must be remembered, constructed equipment for the ships in which Drake and Raleigh sought lands across the oceans to add territory to our Empire and lustre to our name. At this time, too, the commercial centres of the European Continent were vital to British trade, and to these the south-east was in closest proximity. It was not until much later that position in relation to America became important and gave the north-west a distinct advantage, in this respect, over the south-east.

To-day, of course, the chief factor underlying the distribution of population in these islands is the localisation of manufacturing industries, supported by coal, and the direction of commerce. It is no longer necessary for men to live where their food is produced, for the application of mechanical power to transport has made it possible for a man's "home space" to be very widely separated from his "food space" and even from his "work space." Hence has been brought about the great and rapid expansion of towns and industries on the coalfields.

The most densely populated districts of the British Isles to-day are South Lancashire, the West Riding of Yorkshire, the Tyne region, Staffordshire (the "Black Country"), the Scottish Lowlands, South Wales and the Metropolitan commercial area, all of which, with the exception of the last-named, are highly industrialised coal-mining districts. The worker tends to move to the places where he can most profitably offer his services, as, for example, to the industrial areas where the demand for labour is normally large and continuous.

It is clear that pastoral occupations cannot give employment to as many people as arable farming, while neither support such dense populations as are found in industrial areas. The pastoral areas of the British Isles, *e.g.*, the Welsh Hills and the Highlands and Southern Uplands of Scotland, are, therefore, the most thinly populated parts, while the agricultural districts occupy an intermediate position, though they support populations not nearly as dense as those of the industrial areas.

In parts of the Islands where all three types of occupations are important, the effect of the presence of coal in causing the concentration of population is more clearly seen. The fertile and agricultural Plain of York, for example, has a much less dense population than the neighbouring industrial regions lying on the Yorkshire slopes of the Pennines.

Where, on the other hand, there are no highly industrialised coal-mining regions, the population is comparatively evenly distributed. This is so in Ireland, where in only a few small areas, the chief of which are round Dublin and Belfast, is the population dense.

There has of late been a marked tendency for industries to migrate to the south of England, which, thanks to modern developments, offers greater attractions than the already industrialised north. Power in the form of electricity can now be distributed far and wide from centralised generating plants situated many miles from the places of use, while the southern counties of England have advantages over those of the north in lower rents and rates as well as a more favourable climate.

OVERSEAS TRADE OF THE UNITED KINGDOM

In normal times the total value of British trade is enormous and at the peak of the last trade boom, in 1929, the imports were valued at about £1,220,000,000 and the exports at £840,000,000. The vast quantities of food-stuffs and raw materials imported each year are balanced by "visible" exports of coal and manufactures and by "invisible" exports in the form of shipping, banking, investment and insurance services. In value, some four-fifths of the exports consist of manufactured goods, but coal is first in quantity.

Since 1929, however, there has been a great decline in trade, and whereas in 1930, which may be adopted as a "normal" year for future comparisons, the imports were valued at about £1,044,000,000 and exports at £658,000,000, in 1933 it has been estimated that the total value of imports was only £676,000,000, whilst the total value of exports had fallen to £416,000,000. The principal items entering into the trade of the United Kingdom for 1930 and 1933 are shown in the Table below.

Commerce of the United Kingdom[1]

EXPORTS (£ *mils.*)	1930	1933	IMPORTS (£ *mils.*)	1930	1933
Cotton goods	87·6	58·9	Meat	111·7	77·6
Iron and steel goods	51·3	29·9	Grain and Flour	72·9	55·0
Vehicles	50·7	21·6	Oils, etc.	46·3	30·2
Machinery	46·9	27·0	Wool	45·3	37·4
Coal	45·7	31·4	Cotton	44·0	36·8
Woollens	37·0	25·6	Wood and Timber	42·8	29·9
Chemicals, etc.	22·0	17·5	Oil seeds, etc.	33·9	21·1
Other textiles	21·1	14·9	Metals (non-ferrous)	29·4	15·7
Apparel	19·8	10·7	Iron and steel goods	23·3	6·1

---

[1] Figures from the *Statesman's Year Book*.

The leading exporters to the United Kingdom in order of decreasing importance by value in 1933 were the United States, Australia, Canada, Argentina, India, New Zealand, Denmark, Germany, France, the Netherlands, the Irish Free State and Sweden. The principal countries to which our exports are sent are shown in the Table below.

Principal Customers of the United Kingdom

India	Cotton goods, iron and steel goods, machinery.
U.S.A.	Woollen, linen, cotton and iron and steel goods.
Australia	Cotton, woollen and iron and steel goods, machinery, motor-cars, chemicals.
Germany	Cotton goods, coal, fish, machinery, iron and steel goods.
Canada	Woollen and cotton goods, spirits, iron and steel goods, apparel.
Union of S. Africa	Textiles, vehicles, machinery, iron and steel goods.
France	Coal, machinery, woollen goods, iron and steel goods.
Argentina	Iron and steel, machinery and railway carriages, cotton and woollen goods, coal, electrical goods, locomotives.

Trade of the Irish Free State

The figures relating to the total trade of the Irish Free State in 1929 were: *exports*, £47 millions; *imports*, £61 millions. Of these totals, the exports to Great Britain and Northern Ireland amounted to £38 millions and the imports to £42 millions. In 1932, the total value of exports was £27 millions (£22 millions to the United Kingdom) and of imports £43 millions (£29 millions from the United Kingdom). The leading items of export are live cattle (30 per cent. of the total value), beer and stout, eggs, butter, horses, pigs, bacon and hams, pork, sheep and poultry; the chief imports comprise wheat and wheat flour, coal, maize, clothing, tea, iron and steel, machinery, oils, paper, chemicals, fruit and timber.

The predominant share of Britain[1] in the trade of the Irish Free State (and also of Northern Ireland) is due partly to the fact that Britain is the natural market for Irish produce and partly because Britain acts as an entrepôt for Ireland. The entrepôt trade has arisen because of (*a*) the system of buying and selling through agents, and (*b*) the regularity of the sailing of ships from certain ports. As an example of the former we may instance a firm in London which buys or sells goods for a firm in Calcutta. If the Calcutta firm wants, say, linen, cotton and woollen goods, it instructs its London representatives to buy these goods. The London house places the orders for the different classes of goods in Belfast, Manchester and Leeds respectively, and the several parcels are sent to London for transmission abroad. The linen export thus appears as going out *via* London. With regard to the second cause, we may instance the case of a Belfast merchant who wishes to send mineral water to the West Indies. Ships occasionally go from the Free State to these islands, but they do so at irregular intervals which can seldom be calculated beforehand. The merchant, therefore, sends his cases to Liverpool, knowing exactly that on a certain day and at a certain hour a ship will sail for the West Indies and deliver his goods in due course to their new owner. From the other aspect goods are brought from all over the world to London, Liverpool, Glasgow, etc., and thence distributed to all parts of the British Isles, coming into Ireland as cross-channel imports to Dublin, etc."[1]

---

[1] At the time of writing the dispute between the Irish Free State and the British Government remains unsettled, and heavy import duties have been imposed by each country with a view to excluding the products of the other. If these duties continue, therefore, the trade position between the two countries is likely to be considerably modified.

THE BRITISH EMPIRE

The British Empire comprises nearly a quarter of both the land surface and the total population of the globe and, though by far the greater proportion lies in the temperate zone, it embraces every type of natural region. Its territories are scattered throughout the world from the shores of the Arctic Ocean to Antarctica, and among its inhabitants it can count members of every race of mankind and peoples in every stage of development from barbarism to the highest level of civilisation. These characteristics of the Empire not only mean that its people can draw from its vast dominions a great variety of products—a matter of great economic importance—but also cultivate in the members of the British race a unique breadth of outlook on world problems, and make the solution of such problems a matter of very real interest to them.

The British Empire is not merely a large aggregate of British possessions thrown together under one flag; it is something far greater than the sum of its geographical and ethnographical components. The very scattered character of the Empire has given birth to a number of self-reliant young dominions, keenly conscious of their own nationality, governing themselves in their own way and formulating their own economic policy. The Empire is a *Commonwealth of Nations* unprecedented in the history of the world, a unity standing for a common interest, owing allegiance to an imperial ideal represented by the Crown, rendered more intimate by a common tradition and a common language, and, since the Great War, strengthened by the sharing of a great common danger.

Imperial Relations

Several of the various constituent parts of the Empire have now achieved some measure of maturity, and are acquiring economic strength based on rich natural resources coupled with the advantages of scientific and technical knowledge and research. Distance, at one time a great drawback from the point of view of communication, is constantly being more effectively bridged, and the closer contact between the countries is giving rise to new and important problems. The Mother Country has now to deal with a family far beyond the infant and dependent stage. To some extent, indeed, the conditions of a century ago are reversed, Britain herself now being the dependent one and having to rely on her sturdy offspring for raw materials, for markets and even for man-power in time of war. It is natural in these circumstances that the relations between Britain and the Dominions and Colonies should have changed with the passage of time, just as those between the head of a family and his sons change as they reach maturity.

---

[1] Williamson, *A Commercial Geography of Ireland.*

The most notable feature in Imperial relations to-day is the growing personal contact between the Governments of the Empire, evidenced in *Imperial Conferences*. These conferences are held from time to time for the consideration of matters affecting the Empire as a whole and its relations with foreign Powers and the League of Nations. The most urgent problem dealt with by recent conferences concerns the status of the Dominions, involving the reconciliation of the principle of self-government with an Imperial Foreign Policy, Imperial Defence, Imperial Preference and concerted action in such matters as emigration, world finance and tariff policy.

More and more is the Empire tending to become a commercial unit with its parts bound closely by economic and financial interests, as well as by tradition and sentiment. The greatest basis of this unity is that the Colonies and Dominions provide what Great Britain needs urgently, *i.e.*, markets, while Great Britain can supply what the Colonies and Dominions most require, *i.e.*, "men, money and markets."

Nevertheless, the relations between the Mother Country and the various parts of the Empire differ considerably. There are countries of the Empire, those colonised by the British people, where self-government is well developed and where the only tangible tie with the Imperial Government is a Governor-General representing the King; these are lands which have already attained or are rapidly attaining economic independence. On the other hand, there are vast tracts of territory where development is backward, where civilisation is in various stages and is very rarely beyond what it was in England as long ago as the sixteenth century. Such are the tropical and sub-tropical regions where western civilisation has not been able to penetrate mainly because the climatic conditions render it impossible for the white man to settle and work, and because native intelligence and initiative are so far behind those of western peoples. In such lands the administration of affairs has to be undertaken by a controlling administrative body working under direct instructions from the authorities of the Motherland.

In view of such conditions, the amount of self-government possessed by the countries of the Empire necessarily shows considerable variation.

Where white men predominate, self-government tends to be the rule, but where the inhabitants are still mainly native, Imperial control is exercised, though in differing degrees.

Composition and Extent of the Empire

As regards its composition, the British Empire may conveniently be dealt with under two main headings, *viz.*, (*a*) The British Isles ; and (*b*) the British Dominions beyond the Seas, which include the Colonies, the Indian Empire, the self-governing Dominions and the Protectorates and other Dependencies.

THE BRITISH ISLES. The constituent parts of the British Isles have already been described (Chapter 24). Regionally, the smaller islands round the coasts form part of the country or county to which they are adjacent, *e.g.*, the Isle of Wight is linked with Hampshire.

Ireland was, by the *Government of Ireland Act*, 1920, divided into two states : *Northern Ireland*, consisting of six of the nine counties of Ulster, and *Southern Ireland*, consisting of the rest of the island. By the *Irish Free State Constitution Act*, 1922, Southern Ireland became the Irish Free State, a self-governing Dominion and " a co-equal member of the community of nations forming the British Commonwealth of Nations."

The Isle of Man, though subject to the sovereignty of the British Parliament, has a parliament of its own, consisting of the Governor, the Council and the famous and ancient House of Keys. The acts of this Assembly must, however, receive the assent of the King in Council before they have legal effect.

The Channel Islands are composed of a group of islands of which the two largest, Jersey and Guernsey, have their own legislatures, but, like the Isle of Man, are subject to the Imperial Parliament. Most of the smaller islands of the group are treated as part of Guernsey.

The British Dominions Beyond the Seas

THE COLONIES, strictly speaking, are " any part of His Majesty's dominions exclusive of the British Islands and of British India," but in practice, the self-governing Dominions are not known as " colonies," for there is a marked difference between them and colonies within the ordinary meaning of the term. Self-governing Dominions are equal and independent nations in the Empire, having a right to a voice in deciding Imperial foreign policy. "Colonies," however, do not enjoy full self-government, the Imperial Parliament being responsible in varying degrees for their administration.

The Self-Governing Dominions. These are :—

(1) The Dominion of Canada.
(2) The Commonwealth of Australia.
(3) The Dominion of New Zealand.
(4) The Union of South Africa.
(5) Newfoundland.
(6) The Irish Free State.

Crown Colonies are Colonies other than self-governing Dominions. These are very numerous and differ very much in their constitutions. They vary in type from Malaya, which enjoys responsible self-government as regards its internal affairs, to Gibraltar, which is without a legislative council of any kind and is governed directly from home.

The Indian Empire is a great dependency quite distinct in type from other constituents of the Empire, but British sovereignty over India is becoming less complete, as that country is gradually moving towards complete self-government on equal terms with the Dominions.

Protectorates and Other Dependencies. The term "dependency," used in its imperial sense, indicates any British possession not having self-government. The term has, however, a much narrower meaning, indicating an area, not strictly within the Empire, which is so much under British influence that it is for all practical purposes a British possession. The chief of the many varieties of these is the Protectorate.

A *Protectorate* is a country governed by native rulers by whom it

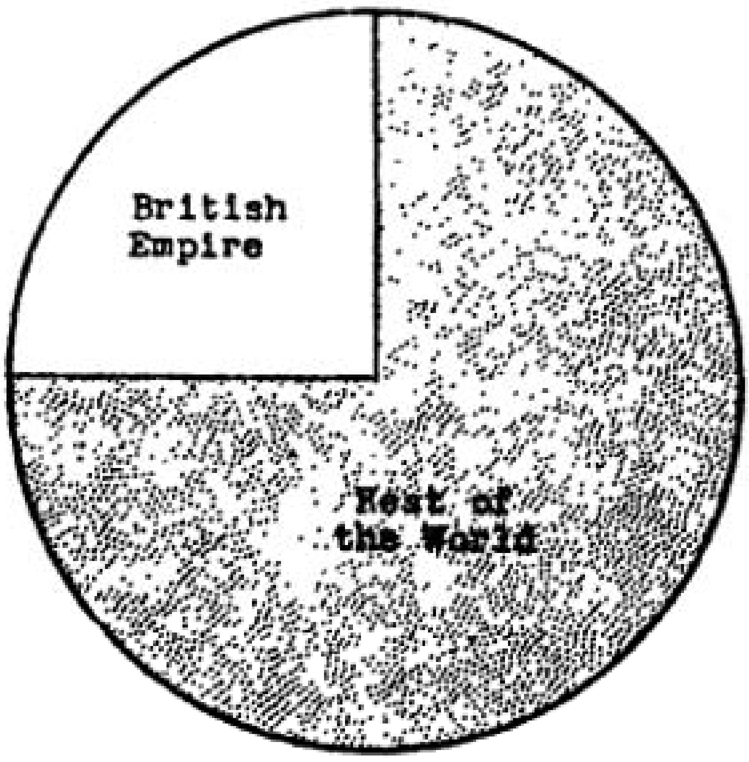


Fig. 170: Comparative Areas of the British Empire and the Rest of the World.

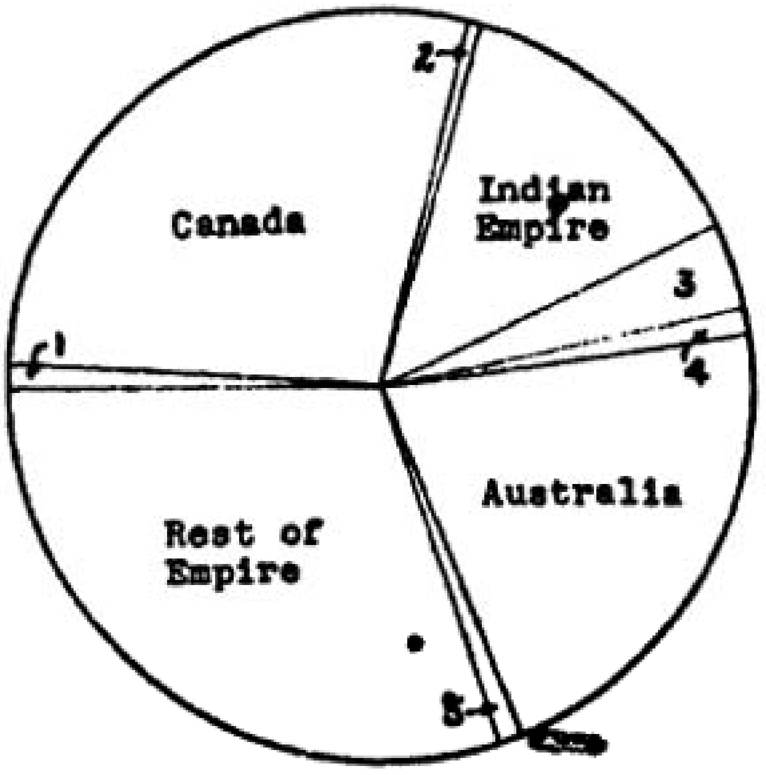


Fig. 171: Comparative Areas of the Countries of the Empire.

1. British Isles. 2. Newfoundland. 3. Union of South Africa. 4. Southern Rhodesia. 5. New Zealand.

has been placed under British protection, though not as a part of the Empire. The term, therefore, indicates control as opposed to ownership. In most such cases, however, protection has led to complete British occupation and administration in the interests of peace and security, and the power left to the local kings or chiefs is generally very small. This is the case in the Protectorates of Uganda and Zanzibar. In the Bechuanaland Protectorate, on the other hand, the people are still ruled by the native chiefs under supervision and advice, while the Federated Malay States, also, retain their native rulers.

A Mandatory Sphere is a territory which has been placed by the League of Nations under the care of one of the "advanced nations who by reason of their resources, their experience, or their geographical position, can best undertake this responsibility." The nations so made responsible for the welfare of the peoples placed under their care render to the Council of the League an annual report on their charge. The chief areas subject to British mandatory influence are Palestine, S.W. Africa and Tanganyika Territory.

A Sphere of Influence is yet another type of Protectorate, being a territory over which the influencing Power has undertaken not to acquire sovereignty. Persia before the War was in the British sphere of influence.

Fig. 170 shows the area of the British Empire in comparison with the rest of the world; and Fig. 171 shows the relative areas of the various parts of the Empire.

Population of the Empire

The lands of the Empire lying within the temperate zones have a total area of about 4¾ million square miles, but, while the mean density of population over the total inhabited area of the earth is about 36 persons to the square mile, in the British temperate lands it is only 14.

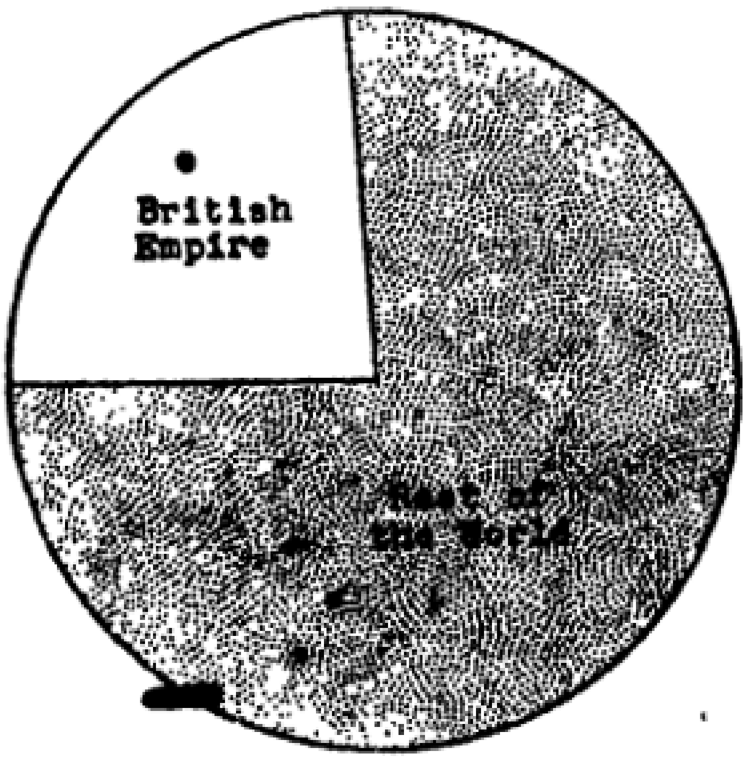


FIG. 172: COMPARATIVE POPULATIONS OF THE BRITISH EMPIRE AND THE REST OF THE WORLD.

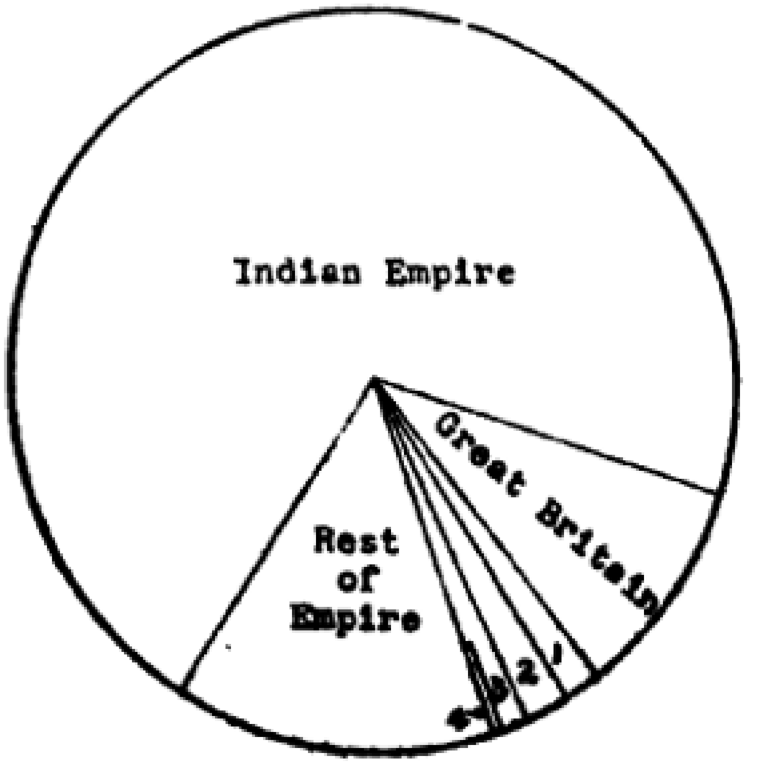


FIG. 173: COMPARATIVE POPULATIONS OF THE COUNTRIES OF THE EMPIRE.

1. Union of South Africa. 2. Canada. 3. Australia. 4. New Zealand.

Even this figure, however, fails to indicate the sparseness of the population throughout the Overseas Dominions, for it must be borne in mind that nearly two-thirds of the white people of the British Empire live in Great Britain. If we omit the British Isles, therefore, the density of population throughout the remainder of the temperate lands of the Empire is less than 5 persons to the square mile. (Compare Figs. 170 and 171 with Figs. 172 and 173). There is thus ample room for the expansion of the white race within the countries of the Empire itself, especially as many of the lands lying within the Tropics experience a climate tempered by the effects of altitude, and are thus fit for white settlement.

Serious problems arise from the under-population of so much valuable land, especially as so many parts of the world are suffering from the effects of over-crowding and urgently desire new lands for colonisation. In Australia, for example, the population is largely concentrated in the towns, and vast tracts of fertile land remain uninhabited. Indeed, the population of the continent is extremely sparse, there being only two persons to the square mile. Moreover, there are vast areas in the tropical region in the north of this great continent which, though unfit for settlement by the white man, are eminently suitable for occupation by natives accustomed to hot and humid climates, and it is not surprising that the peoples of the over-populated Asiatic lands cast envious eyes on the lands which we hold but as yet have failed to settle. There is little doubt that were it not for the fact that the Mother Country would, if necessity arose, come to her assistance, Australia's strict immigration regulations, designed to preserve the land for the white man and to avoid the problems which arise when white and coloured races mix, would be of no avail; for the continent would be forcibly invaded by people of the yellow races.

The number of coloured people living within the temperate lands of the Empire is nearly six millions—a comparatively small number. Moreover, nine-tenths of these live in South Africa, so that elsewhere the coloured population is very small indeed. With few exceptions, the population of the Dominions and Colonies is of British descent—that of Australia and Newfoundland completely so, and that of New Zealand, also, except for the rapidly vanishing race of Maoris in the North Island. Canadians are largely of European descent (French or English) though there are a number of Eskimos and Indians, while in South Africa is a mixture of Europeans (English and Dutch) and natives of very many races, grades and conditions.

It is in the Dependencies—in the wide meaning of the word—that the coloured peoples of the Empire are in the majority. The Dependencies lie chiefly within the Tropics, and here, as a rule, conditions are adverse to colonisation by the white man. These countries are characterised by the great diversity of their peoples (few of whom are white) in race, in language and in religion.

Inter-Empire Trade

Speaking generally, the Empire overseas exports foodstuffs and raw materials and imports manufactured products, while Great Britain exports manufactures and imports primary products. Thus the complementary nature of inter-Imperial trade is apparent.

The volume of trade between the Empire countries as compared with that between the Empire and foreign countries has been increased by the introduction and expansion of the system of Empire preferences. At present, the Empire overseas absorbs more than 40 per cent. of Great Britain's exports, which represents about 30 per cent. of the imports of the overseas Empire, while about 40 per cent. of British imports are from Empire countries.

With the exception of Canada, where the proximity of the United States exerts a powerful influence, about 50 per cent. of the total trade of the Dominions and British India is with British countries.

The expanding resources of the Empire, together with the extension of local markets, must inevitably bring about an increase in the volume of inter-Imperial trade, but there are obvious limiting factors to the extent to which inter-Imperial trade can increase at the expense of trade between the Empire countries and the rest of the world. The Empire market is not sufficient to absorb the total exports of Great Britain, especially since the Dominions and India, themselves, have created and are developing large manufacturing industries. On the other hand, the Empire is deficient in certain important materials, which are essential to Britain, *e.g.*, oil, sugar, meat and cotton.

Again, British markets are not always the nearest markets. Thus, the United States must always have an important share in the trade of Canada and Australia, while the trade between India and other Eastern countries, especially Japan and China, must always be considerable.

Finally, the present organisation of shipping is such that any large-scale development of Empire trade would be difficult to accommodate. British sea trade is dependent on quick deliveries and the transfer of ships from, say, American to Australian routes would involve considerable disorganisation and inconvenience, as it would mean that the clearing of vessels would take about three months instead of three weeks.

For reasons such as these it will, in many cases, be more advantageous for the widely separated parts of the Empire to continue to trade largely with neighbouring foreign countries than with one another.

The problem of the full development of the Empire is thus not by any means a simple one to solve; a consideration of Empire resources demands a knowledge not only of the local conditions in the different countries, but also of their relative positions and of the means of communication between them.

QUESTIONS ON CHAPTER 25

1. Analyse carefully the position of Goole, Grantham, Lancaster, Shrewsbury, York. (*R.S.A., Stage I*, 1929)
2. Describe the Irish Free State geographically. (*L.C. of C., Junr.*, 1931)
3. Draw a map of one of the following :—the English Lakes, the Welsh mountains, the Scottish uplands. Write a short account of the *typical* occupations of the people in the area included in your map, and try to explain *in what ways* the geographical conditions have favoured the particular occupations. (*R.S.A., Stage I*, 1929)
4. What are our chief imports ? From what countries and what ports do they come ? What geographical reasons can you give for this ? (*R.S.A., Stage I*, 1931)
5. *Compare*, from the standpoint of economic geography, the Newcastle and the Birmingham districts. (*R.S.A., Stage I*, 1931)
6. Write notes on the position, appearance and on the occupation of the inhabitants of *four* of the following districts :—Dartmoor, the South Downs, the Fen Country, the Lake District, the Carse of Gowrie, the Hebrides. (*C.I.S. Prelim., Dec.*, 1931)
7. Describe the industrial development of the South Wales coalfield, and contrast it with that of South Lancashire. As far as possible account for the differences you mention. (*C.I.S. Prelim., Dec.*, 1931)
8. In what respects, and for what reasons, would you expect to find the scenery and the typical occupations in Wales like, or unlike, those in Ulster ? (*R.S.A., Stage I*, 1931)
9. Discuss the distribution of Industry in Great Britain, and account for the so-called "Southern drift of Industry." (*C.C.S. Prelim., May*, 1931)
10. State the exact position of *six only* of the following towns, giving the principal industries carried on in them, and explain why they have attained the importance they possess :—Bristol, Newcastle, Burton, Northampton, Southampton, Torquay, Cork, Dublin, Dundee, Paisley. (*S.A.A. Prelim., Nov.*, 1931)
11. Select any two rivers of the British Isles and in each case analyse the position of towns situated at the mouth or up the river. Where you can, account for the growth of towns. Why is it that the majority of British rivers have estuaries and deltas ? (*C.I.I. Prelim.*, 1928)
12. Illustrate by means of a sketch-map (*a*) the relief, (*b*) the river-system, (*c*) the position of the towns, of the region comprising the North and South Downs and the Weald. (*I.S.A. Prelim., June*, 1929)
13. On a sketch-map of England mark in the following :—
    (*a*) Rivers Trent and Thames.
    (*b*) The Pennine Range, Dartmoor, the South Downs.
    (*c*) Liverpool, Cardiff, Bournemouth, Birmingham, Nottingham.
    (*d*) The main lines of the L.M.S. Railway and the G.W. Railway.
    (*e*) The chief wheat-growing areas.
    (*f*) Two coal-mining areas.
    (*g*) The areas of least and greatest rainfall.
    (*h*) The chief sheep-rearing districts. (*C.C.S. Prelim., Nov.*, 1930)
14. Contrast the climate and structure of N. Wales and E. Anglia. Show how the differences you mention have affected the occupations of the inhabitants of these two regions. (*C.I.S. Prelim.. Dec.*, 1930)
15. Explain briefly how the presence of coal has aided the development of the chief industries on *either*
    (*a*) The South Wales Coalfield
    OR
    (*b*) The Northumberland and Durham Coalfield. (*I. of B., Qual.*, 1929)

16. Account for the main occupations of the Thames valley (excluding London). (*I. of B., Qual.*, 1930)
17. The direct foreign trade of all Irish seaports is small, though both Northern Ireland and the Irish Free State carry on extensive trade with foreign countries and outlying British territories. How is this trade carried on and why? (*I. of B., Pt. I*, 1929)
18. Draw a sketch map to show the position and extent of the chief coalfields of Great Britain. Select any one coalfield and write an account of the industries connected with it. (*C.I.I. Prelim.*, 1928)
19. Point out the important contrasts in the occupations of the people of Lincolnshire and of South-east Lancashire. (*L.C. of C., Junr.*, 1928)
20. Ships are made at Glasgow, woollen textiles at Leeds, beer at Maidstone, soap at Liverpool. Show by sketch-maps, the positions of any *two* of these places and explain why each is specially suited to the industry. (*C.S., Nov.*, 1931)
21. On a map of the British Isles, shade in red and name the Pennine Uplands and the South Downs. Name the rivers Forth, Shannon and Trent, the Bristol Channel and the Outer Hebrides. Mark and name Liverpool, Oxford, Southampton, York, Dublin. Indicate by shading in black pencil, the position of two coalfields; on each print the name of the chief industry, besides coal mining, carried on in the area, and mark and name *one* town associated with that industry. (*C.S., May*, 1930)
22. Among the ships which arrived at British ports on a certain day there was one which entered the port of Liverpool with a cargo of raw cotton; another entered the port of Cardiff with iron-ore; a third entered the port of Hull with timber; and a fourth entered the port of Dundee with oranges. State from what part of the world each of these four ships probably came, and then explain what will be done with its cargo after it has been landed at the British port. (*C.S., May*, 1927)
23. Draw a sketch-map of Ireland and on it show by shading the position of the chief upland areas, adding the names of the most important. Show also, with names, the Bog of Allen, and the rivers Shannon, Erne, Barrow and Suir. Mark and name the towns Belfast, Cork, Dublin, Limerick. (*C.S., Dec.*, 1926)
24. Name *three* of the chief industries of the inhabitants of England north of the Mersey and Humber. At which centres are those activities specially important? Why do they exist at those centres? (*C.S., Dec.*, 1926)
25. Compare and contrast the position of England south of the Thames and the Bristol Channel with the portion of Scotland north of the Firths of Forth and Clyde as to relief, climate, products, and the occupations of the inhabitants. (*C.S., June*, 1925)
26. Describe the position, climate, surface features, scenery and chief occupations of *one* of the following areas:—
    (*a*) Devon and Cornwall;
    (*b*) Vale of Evesham;
    (*c*) the Scottish highlands. (*C.S., March*, 1930)
27. Give reasons for the association of the West Riding of Yorkshire with the woollen industry, South Ireland with the dairy industry, Dundee with the jam industry, and North Staffordshire with the pottery industry. (*C.S., March*, 1931)
28. What industries have arisen in the west of the Lowland Valley of Scotland? As far as possible give reasons for their growth. (*C.I.S. Prelim., June*, 1932)

CHAPTER 26

ASIA

Asia is the largest of the continents, stretching from lat. 80°N. to lat. 10°S., and from long. 30°E. to long. 170°W., with a total area of 17,000,000 sq. miles. The Arctic Ocean forms the northern boundary, Europe lies on the west (the Ural Mountains forming part of the boundary line), while the Indian and Pacific Oceans respectively form the southern and eastern boundaries.

Relief

1. The Great Plains of the North and West occupy almost the whole of Siberia and stretch from the Arctic Ocean in the north to the Caspian Sea in the south-west. The plains are drained by the great rivers Ob, Yenisei and Lena, which in winter have frozen lower courses and overflowing upper courses.

2. The Mountain and Plateau Region. Stretching across the south of Asia is a vast mountain area the centre of which is the *Pamir Knot*, to the north-west of India. From this central core, ranges run east, south, west and north-west. The *Karakoram Range* runs south-east, dividing into (*a*) the *Altyns* and *Kwenlun* in the north (enclosing the lower Tsaidam Swamp), and (*b*) the great range of the *Himalayas* of northern India to the south. Between these two branches lies the high *Tibetan Plateau*. Offshoots of this great mass run south through Burma, Malaya and the East Indies and through western China and Indo-China. From the north-east of the Pamirs run the *Tien Shan*, and between this range and the Altyns lies the lower *Tarim Basin*, draining inland to the lake known as Lob Nor.

North-east of the Tien Shan are the *Altai*, *Khangai* and *Sayan* ranges of northern Mongolia, whilst southern Mongolia contains the great *Gobi* or *Shamo Plateau*. East of Lake Baikal in south-east Siberia lies the *Transbaikal Plateau* and in the extreme north-east of Asia bordering the Sea of Okhotsk are the *Stanovoi Mountains*.

To the south-west of the Pamirs are the *Hindu Kush*, which divide (*a*) west as the mountains of Afghanistan and the *Elburz Mountains*, and (*b*) south and west as the *Sulaiman Range* of north-west India, the south *Persian Mountains*, the *Zagros Mountains* and the *Kurdistan Highlands*. These two main branches enclose the *Iran* or *Persian Plateau*, and converge in the west in the *Armenian Knot*, which sends two branches westwards—the *Taurus* in the south and the *Pontus* in the north—enclosing the *Plateau of Asia Minor*. There are, in addition, two other important plateaus in Asia—the plateau of *Peninsular India* and the *Arabian Plateau*.

3. THE RIVER BASINS are commercially, and from the point of view of the inhabitants, the most important part of the continent. They include the basins of the *Euphrates* and the *Tigris* of Iraq; the *Ganges*, the *Indus* and the *Brahmaputra* of India; the *Irawadi* of Burma; and of the *Yangtse Kiang*, the *Hwangho* and *Si-Kiang* of China. All these basins are low, fertile regions largely covered with alluvium.

4. THE ISLANDS lie in festoon formation off the east coast. From the north they contain *Sakhalin* (Karafuto) and the *Kuriles*, the *Japanese Islands*, the *Philippine Islands*, *Borneo*, the *Celebes*, *Sumatra*, *Java* and *Timor*. These festoons represent a line of weakness in the earth's crust, and in various parts are subject to volcanic activity and frequent earthquakes. To the south of India is *Ceylon*, while in the west, at the eastern end of the Mediterranean Sea, lies *Cyprus*.

Coastline and Seas

The coastlines of the Asiatic mainland are comparatively regular, because the mountains rarely reach the sea. There are a number of large coastal plains built up of new land formed from alluvium brought down by the rivers, several of which have vast deltas.

Asia is separated from North America in the north by the *Bering Sea* and the narrow *Bering Strait*. The *Sea of Okhotsk* in the north is almost enclosed by the mainland, the Kamchatka peninsula and the Kurile Islands. The so-called *Gulf of Tartary* is actually a strait between Sakhalin and the mainland. The *Sea of Japan* lies between the mainland and the Japanese islands; the *Yellow Sea* (leading into the *Gulf of Pechihli*) is enclosed by the coast of north China and *Corea* (*Chosen*); while the *East China Sea* lies off the east coast of central China with a string of islands (Kiushui, Riu-kiu and Formosa) to the east and south. Between Tongking (French Indo-China) and the island of *Hainan* is the *Gulf of Tongking*, while between Indo-China and the islands, which include the Philippines and Borneo, is the *South China Sea* (an expanse of water subject to dangerous typhoons).

The *Sulu Sea*, which separates the Philippines from Borneo, is continued as the *Celebes Sea* to the north of Celebes Is. To the east of Borneo, and separating it from Celebes, is the *Macassar Strait*, and east of Celebes is the *Banda Sea*. The *Java Sea* lies between Java and Borneo, the *Timor Sea* south of Timor, the *Sunda Strait* between Java and Sumatra, and the *Strait of Malacca* between the Malay Peninsula and Sumatra. The *Gulf of Siam* lies off the south coast of Siam and separates the Malay Peninsula from southern Indo-China.

In south-west Asia, between Arabia and north-west Africa, is the *Red Sea* opening through the *Bab-el-Mandeb Strait* into the *Gulf of Aden.* The *Persian Gulf* and the *Gulf of Oman* lie between Arabia and Persia; the *Arabian Sea* lies to the west of India and Ceylon; and the *Bay of Bengal* to the east of Peninsular India. Between the Andaman Islands, in the Bay of Bengal, and the Malay Peninsula is the *Andaman Sea*, which, in the north, is known as the *Gulf of Martaban*. The *Aral Sea* or Aral Lake is a small enclosed sea in the south-west of the Cossack Republic (U.S.S.R.).

Climate of Asia

Over the vast expanse of the Asiatic continent, with its varied relief, there must naturally be great variations in climate, ranging from the intensely cold, dry climate of the north to the hot, wet tropical climate of the southern islands and the hot, arid deserts of Arabia and India. In winter the greater part of the continent is cold and is therefore a region of high pressure with outflowing winds. In summer the land is hot and the winds blow in from the high pressure areas over the sea. The great central mountain mass, however, causes the winds to deposit their moisture as they blow against it and so limits the area receiving heavy summer rainfall to the south-east of the continent. The interior at this season is therefore hot and very dry.

In the far northern districts (Tundra) precipitation is negligible and the temperature is low, rarely rising above 50°F. even in the warmest month. On the Great Plains to the west the mean annual rainfall is only about eighteen inches and most of this falls in the summer. Precipitation in winter is in the form of snow. The temperature is one of great extremes, the difference between winter and summer in some parts being as much as 150°F., *i.e.*, from −80°F. in January to 70°F. in July.

In the central plateau region the extremes of temperature are less marked than on the northern plain, but the mean annual rainfall, which is more evenly distributed throughout the year, is lower, as the winds are robbed of most of their moisture before they reach the interior by the plateau edges, the land mass and the mountains to the south. Much of this area is therefore desert, *e.g.*, the Gobi (or Shamo) and Taklamakan deserts.

The mountain regions naturally have a cool climate, with extremes of temperature greater than those of the plateau. The rainfall varies according to position, being heavy on the Himalayas, the western Ghats (India), Burma and Indo-China, owing to the summer monsoon, but elsewhere being comparatively slight.

The river basins of the south-east are very hot and moist, but those of the Euphrates and Tigris, and, indeed, all the lands in the extreme west (Asia Minor, Syria, northern Arabia and western Persia), though experiencing great heat, have winter (Mediterranean) rainfall only.

The climate of the Asiatic islands in the Pacific is naturally modified by the tempering influence of the sea, but north of Hokkaido (Japan) severe winters are experienced. In all the islands the rainfall is generally greater than that of the mainland and decreases from south to north. The islands of the south-east are in the equatorial belt and are subject to great heat and abundant moisture.

Climatic Regions of Asia

1. **The Tundra**, lying in the extreme north mainly within the Arctic Circle, has the typical cold, desolate climate, with very little precipitation except in the form of snow.

2. **The Cold Temperate Region** south of the Tundra has great extremes of climate, particularly in the centre. The summers are warm, the winters very cold and there is a moderate summer rainfall. The climate is a result of latitude, exposure to cold winter winds and distance

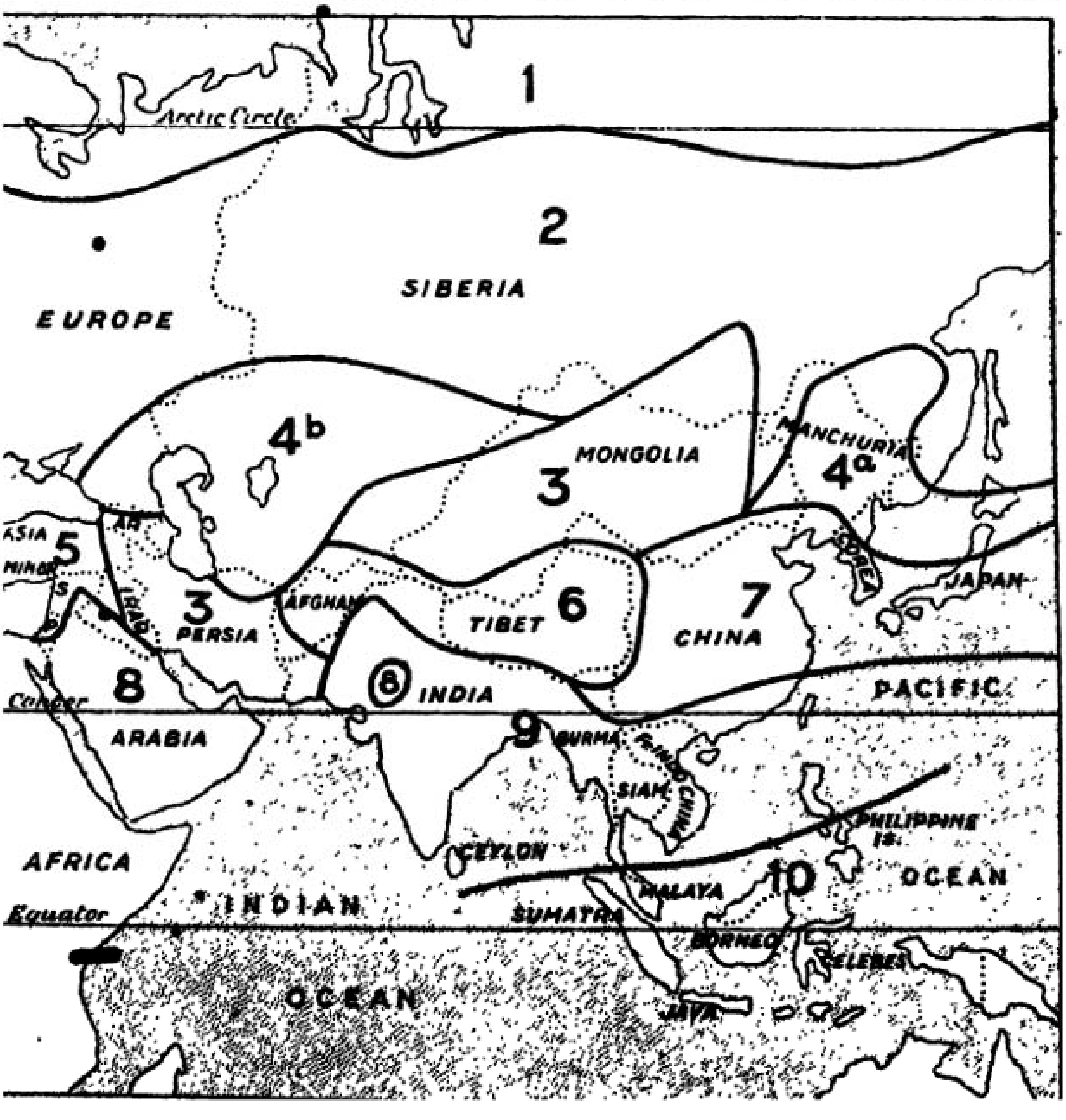


FIG. 173A: NATURAL CLIMATIC REGIONS OF ASIA.

from sea influences.

3. **The Temperate Plateau Deserts** comprise broadly the greater part of Mongolia and of Persia, together with Armenia, part of Iraq, and part of north-west India. Owing to their altitude, these areas all experience a low rainfall, a very great daily range of temperature, and very severe winters.

4. **The Temperate Regions.**—The Cool Temperate Region (4A) lies south-east of the cold temperate region, of which it is really merely a continuation, but, being nearer the sea, the climate is not so severe, and the rainfall occurs mainly in summer, when the region is under the influence of the South-East Monsoon. The Warm Temperate Region (4B) has a higher annual average temperature and a lower rainfall than region (4A), because it is less subject to sea influences.

5. **The Mediterranean Region** is a small area occupying the coastlands of Asia Minor, Syria and Palestine. It has the summer droughts and the mild, moderately wet winters characteristic of all Mediterranean lands. To the east and south the region merges into hot desert, whilst the higher parts of Asia Minor approximate to the Temperate Desert climate owing to their altitude.

6. **The Plateau of Tibet** and mountainous **Yunnan** comprise a region of alternating valleys and ridges, a formation which gives rise to many varieties of climate. On the whole, the valleys are warm and sunny, but the higher parts are frequently snow-covered and uninhabitable. The region is mainly a temperate desert, with outblowing winds in winter and, as a result of relief, dry winds in summer, whilst the highest parts are of the Tundra type.

7. **The Sub-Tropical Region** consists of northern and central China and southern Japan. The rainfall occurs mainly in the summer during the prevalence of the South-East Monsoon, but some rain falls also in winter. Owing to its latitude, however, this is not a typical monsoon region, the range of temperature being greater than in the true monsoon lands, whilst frosts occur in winter. In the summer, fierce and destructive typhoons are experienced off the coast. It is a warm temperate east coast region with the *China* type of climate.

8. **The Hot Desert Region**, in the south-west, is a continuation of the great tropical desert area of the north of Africa. The south-west experiences a small fairly regular rainfall, but the remainder of the region lies in the permanent belt of high pressure which encircles the globe just north of the Tropic of Cancer and thus has outblowing winds throughout the year. The Thar Desert of north-west India also belongs to this region.

9. **The Tropical Monsoon Region**, embracing southern China, Indo-China, and nearly the whole of India, experiences the South-West Monsoon in the summer months. The monsoon, attracted by the low pressure area over the land, blows in from the sea, causing a heavy

rainfall in areas lying on the windward side of such high mountains as the Western Ghats of India, the eastern Himalayas and the mountains of Assam and Burma. In the winter, when the low pressure area lies over the sea, the North-East Monsoon blows from off the land and is therefore dry, but eastern Ceylon receives rain from those winds which have passed over the Bay of Bengal. The Himalayas act as a great climatic barrier, protecting India from the cold winds from the north in winter and robbing the land to the north of the beneficial effects of the South-West Monsoon in summer.

10. The Equatorial Region lies immediately north and south of the Equator and includes the southern Malay Peninsula and the East Indian Archipelago. Here the hot, wet climate is entirely a result of low latitude, modified in places by oceanic influences and variations in relief.

ASIATIC RUSSIA

Area: 6,200,000 sq. miles. *Population*: 18,000,000.

Asiatic Russia stretches from the European boundary in the west to the Pacific Ocean in the east, and from the Arctic Ocean in the north to Persia, Afghanistan, Sin Kiang, Mongolia and Manchuria in the south. The whole area is politically part of the U.S.S.R. and it includes Siberia and a number of smaller republics in the south-west (Cossack Republic, Turkmen Republic, Kirghiz Republic, Uzbek Republic and the Tadzhik Republic).

The greater part is a plain which gradually rises to the Stanovoi Mountains in the north-east, to the high land around Lake Baikal, to the Sayan and Altai mountains on the borders of north-west Mongolia, and to the Pamirs in Tadzhik (on the borders of India and Afghanistan). The climate is typically continental, with cold winters, hot summers (cooler in the north), light summer rainfall and snow in winter. The great rivers (such as the *Ob*, the *Yenisei* and the *Lena*), flowing to the Arctic, are frozen for many months in the year, but are a source of valuable food in the form of fish, and are used for transport during the summer months.

Though there are enormous possibilities in this region, the land is still mainly undeveloped, largely owing to the lack of transport facilities. There are enormous forest areas but, because of the swampy nature of the surface, much of the timber is of poor quality and of little commercial value, whilst large areas are inaccessible. Moreover, there is a lack of cheap transport, as the rivers are available only for a short period in summer and they are also slow flowing. The forests of the east are the most accessible and a considerable timber trade is developing with China and Japan.

Agriculture is the main occupation, the most important area being in the west, where there is an extension of the fertile Black Earth region of European Russia. Spring wheat is the chief crop, followed by oats and rye, whilst barley, potatoes, flax and hemp are grown. The cotton cultivated in the Ferghana Basin (Russian Turkistan) is sufficient to supply the textile mills of the Moscow industrial area of European Russia. Silk is another product of the same region.

Pastoral farming also is important, particularly in the Khirghiz steppelands (the home of the Cossacks), southern Siberia and Transbaikal. There are millions of cattle, sheep, horses, pigs and goats, from which the usual pastoral products are obtained for home consumption, whilst the production of butter has made rapid progress recently and a large quantity is exported.

The great mineral wealth of the region is concentrated mainly in the south. Coal has been located in many areas, but is mined chiefly in the Kuznetsk Basin, the Irkutsk Basin and near Vladivostok. There are large deposits of copper, especially in the Khirghiz, Altai and Yenisei regions, whilst gold (chiefly in the Lena Basin), zinc, lead, silver, petroleum, iron ore, tin, manganese and numerous other metals are available.

Manufactures are not important but are developing as a result of the Five Year Plans, particularly in the mineral areas, *e.g.*, the large industrial plants of the Kuznetsk Metal Combine.

The construction of railways is a vital necessity, but the *Trans-Siberian Railway* (see Fig. 174) is proving of great value in opening up the country. Another important railway line runs from Samara *via* Orenburg to Tashkent, Samarkand and Merv and thence to Krasnovodsk, on the Caspian Sea, and to Kushk in Afghanistan.

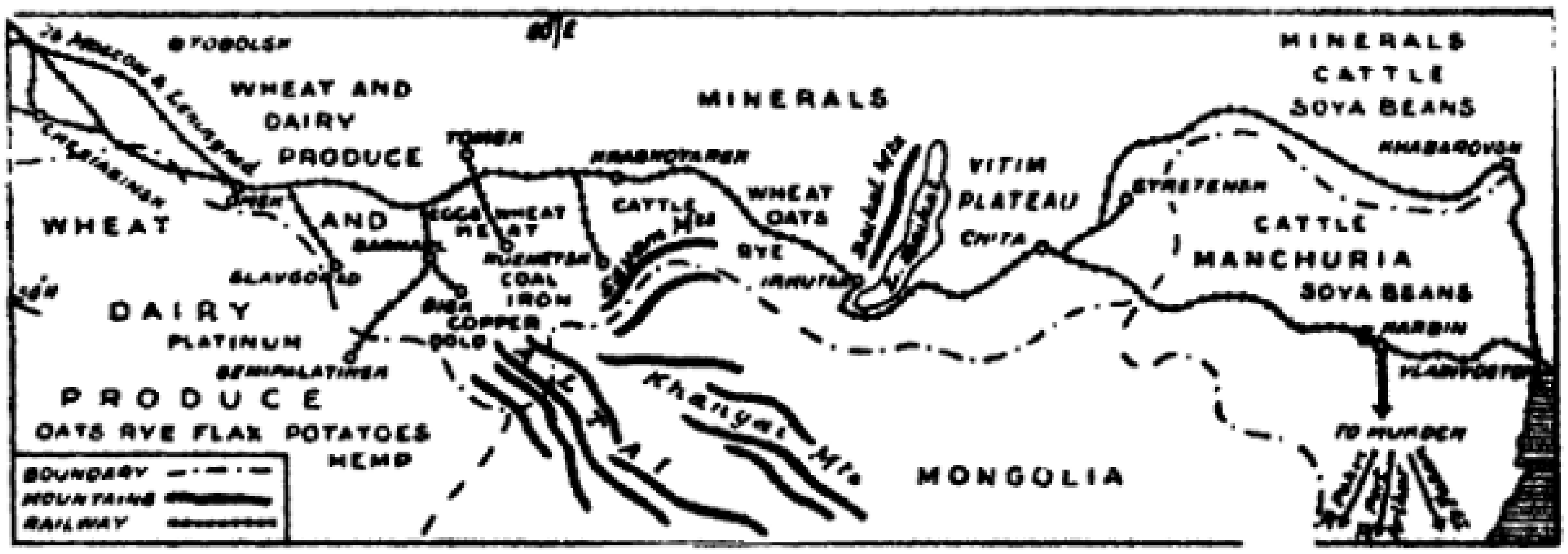


FIG. 174: TRANS-SIBERIAN RAILWAY.

The new Turkestan-Siberian Railway joins the Trans-Siberian line to the Tashkent line *via* Semipalatinsk and Alma Ata. This will enable lumber and grain to be transported south from Siberia, so that the southern areas can concentrate more upon the production of cotton.

The trade of the country is at present not very large but is increasing. *Vladivostok*, in the extreme south-east of Siberia, is an important port, and the eastern terminus of the Trans-Siberian Railway. It has a fine harbour, which is kept open in winter by ice-breakers, and is the outlet for the products of Manchuria, notably beans and beancake.

SOUTH-WEST ASIA

Asiatic Turkey

Asiatic Turkey, which comprises that part of the Turkish Republic which lies in Asia, has an area of about 285,000 sq. miles and a population of over 13,000,000. It is a high plateau region situated between the Black Sea and the Mediterranean Sea and is drained by rivers flowing chiefly northwards to the Black Sea. Rising from the Plateau are the *Taurus Mountains* in the south and *Mount Ararat* in the east. The climate is on the whole one of extremes, though it varies from great extremes on the plateau to insular conditions on the coastal margins. Winter rains are general except in the east, where summer rain is prevalent. The greater part of the country is poor steppeland, with stock rearing as the main occupation, a notable product being the wool obtained from the Angora goat. The mineral wealth is undeveloped.

The coastal areas are the most productive, and here Mediterranean fruits, cereals, the mulberry (for silk), cotton and tobacco are cultivated, whilst the production of olive oil and the fisheries are important.

Mandated Territories

The mandated territories of South-West Asia comprise :—

SYRIA AND LEBANON (*area* : 60,000 sq. miles ; *population:* 2,850,000), under French Mandate ; and

PALESTINE AND TRANS-JORDAN (*area* : 10,000 sq. miles ; *population* : 1,000,000), under British Mandate.

These countries extend from Turkey in the north to Arabia in the south, and from the Mediterranean and the Sinai Peninsula in the west to Iraq in the east. The relief consists of a narrow coastal plain separated from the interior tableland by the *Lebanon Range*. The Euphrates cuts a wide valley through the north-west of Syria, while the Jordan flows from north to south in a rift valley to the *Dead Sea* between Palestine and Trans-Jordan. The coastal strip experiences a Mediterranean type of climate, which gradually merges into the desert of the interior.

SYRIA is an agricultural country, with wheat and barley as the chief cereals and a smaller production of millet and maize. The production of raw silk is an ancient and important occupation, and Mediterranean fruits are grown, particularly olives, grapes, oranges and figs, whilst cotton and tobacco are increasing in importance. There are large numbers of sheep and goats but little mineral wealth. Cotton, wool, silk and fruits are the chief exports ; textiles and cereals comprise the bulk of the imports.

PALESTINE also is essentially agricultural, the only notable mineral being salt from the shores of the Dead Sea and in the valley of the Jordan. Wheat and barley are again the chief cereals, whilst olives, tobacco, sesame and the vine are important. The cultivation of bananas has been introduced with success in the Jordan valley and there is a large production of the well-known Jaffa oranges, which provide a considerable proportion of the total exports. The leading imports are textiles, cereals, sugar, cattle, timber, petroleum and motor-cars.

Cyprus

Although lying in the Mediterranean, the British island colony of Cyprus is geographically part of Asia. The island is situated in the north-eastern corner of the sea away from the steamship routes and is, therefore, unlike Gibraltar and Malta in that it is neither a port of call nor a coaling station and has no regular steamship service with the British Isles. Its political importance depends on the fact that, were the island occupied by a foreign power, it might well be utilised as a base from which to strike at the Suez Canal.

Physically, Cyprus consists of two parallel mountain ranges running east and west, between which lies a relatively low area of fertile soil. The area of the island is about 3,600 square miles and its population 350,000. The coastline is lacking in good harbours, and the streams are short and rapid and of no use for navigation.

The climate is of the usual Mediterranean type, and the vegetable products are those characteristic of it. Cereals, olives and grapes all are important, and caroub beans ("locusts") are specially so. The mulberry flourishes, and sericulture is carried on. Cotton and maize are grown with the aid of irrigation during the hot summer. In addition, the mineral wealth is considerable, iron pyrites, gypsum and asbestos being worked.

The *exports* of Cyprus consist chiefly of "locusts" (used in the manufacture of cattle food), iron pyrites, animals, wine, fruit (particularly lemons), potatoes and asbestos, mainly exported to Egypt and the United Kingdom. The *imports*, chiefly supplied by Great Britain, are composed largely of manufactured goods.

The chief towns are *Nicosia*, the capital, situated on the inland plain; *Larnaka*, on the south coast, the chief commercial centre; and *Famagusta*, on the east coast, the best harbour.

Arabia

Arabia is bounded on the north by the mandated territories and Iraq, on the west by the Red Sea, on the south by the Indian Ocean and on the east by the Persian Gulf. It has an area of 1,000,000 sq. miles and a population of about 10,000,000, consisting mainly of nomadic Bedouin tribes. The whole country is a desert plateau sloping from the mountain barrier in the west to the eastern coastal strip, but rising again in the extreme south-east to the mountains of Oman. There are no rivers, and much of the land is still unexplored. The climate of the south coast is extremely hot, and great extremes of temperature are experienced inland. Rainfall is practically negligible, and the desert is relieved only by a few scattered oases, where fruit, particularly dates, and cereals are cultivated. The Bedouins eke out a precarious living by breeding camels, goats and sheep. *Mocha*, in the south-west, is famous for its coffee.

ADEN, a British fortress situated on a volcanic peninsula of the Arabian coast, about 100 miles east of the Strait of Bab-el-Mandeb, is geographically the most important part of Arabia because of its commanding position, which has earned for it the name "the Gibraltar of the East." Its good harbour and important position at the converging point of routes to the Red Sea and the Suez Canal from India, Ceylon, Australia and the east coast of Africa account for its strategic value to the British Empire, as well as for its importance as a coaling and oil-fuelling station. The climate is hot and dry and there are no local products. There is, however, a considerable entrepôt trade.

Aden is politically a province of India under a Commissioner who is subject to the direct control of the Government of India, except in military affairs, which are in the hands of the Royal Air Force. Complete separation from India is under consideration. Attached to it for administrative purposes are the *Aden Protectorate*, on the mainland; the island of *Perim*, an important cable, coaling and oil-fuelling station, with a good harbour, in the middle of the Strait of Bab-el-Mandeb; *Sokotra*, an island off the north-east coast of Africa, producing dates and various gums; and the *Kuria Muria Islands*, off the coast of Arabia, which were ceded by the Sultan of Muskat as a landing point for the Red Sea cable.

Bahrein Islands

The Bahreins are a group of five islands in the Persian Gulf, 20 miles off the coast of Arabia. They constitute a British Protectorate under a native ruler in treaty relations with the Government of India, which is represented by a Political Agent. The islands are the centre of the important pearl fisheries of the Gulf, over 500 boats of various sizes and 15,000 divers being engaged in the industry. They also produce dates and a fine breed of white donkey. Oil has recently been discovered and is being developed.

The importance of the islands to the British Empire has hitherto been chiefly strategic, in that they provided the key to the control of the Persian Gulf, the head of which, until the recent establishment of the friendly Kingdom of Iraq, was always regarded as a weak spot in our defences round the Indian Ocean because of the existence in Mesopotamia of strong Turkish and German influences. In recent years the islands have become an important station on the Imperial air route to the East.

Iraq (Mesopotamia)

Iraq is bounded on the west by Syria and Trans-Jordan, on the north by Turkey, on the east by Persia and on the south by Arabia. It has an area of 177,148 sq. miles and a population of about 3 millions. From 1918 to 1927 it was under British mandate, but is now an independent State. The country consists of the wide *plains* of the Euphrates and Tigris (the old Mesopotamia) and a *desert* area in the west. The climate is warm in winter, hot in summer and the rainfall very low, decreasing from north to south. The plains are exceedingly fertile, but can be made productive only by extensive irrigation, to which careful attention is now being given. The principal agricultural products are wheat, barley, wool and cotton, all of which are exported, and dates. Petroleum

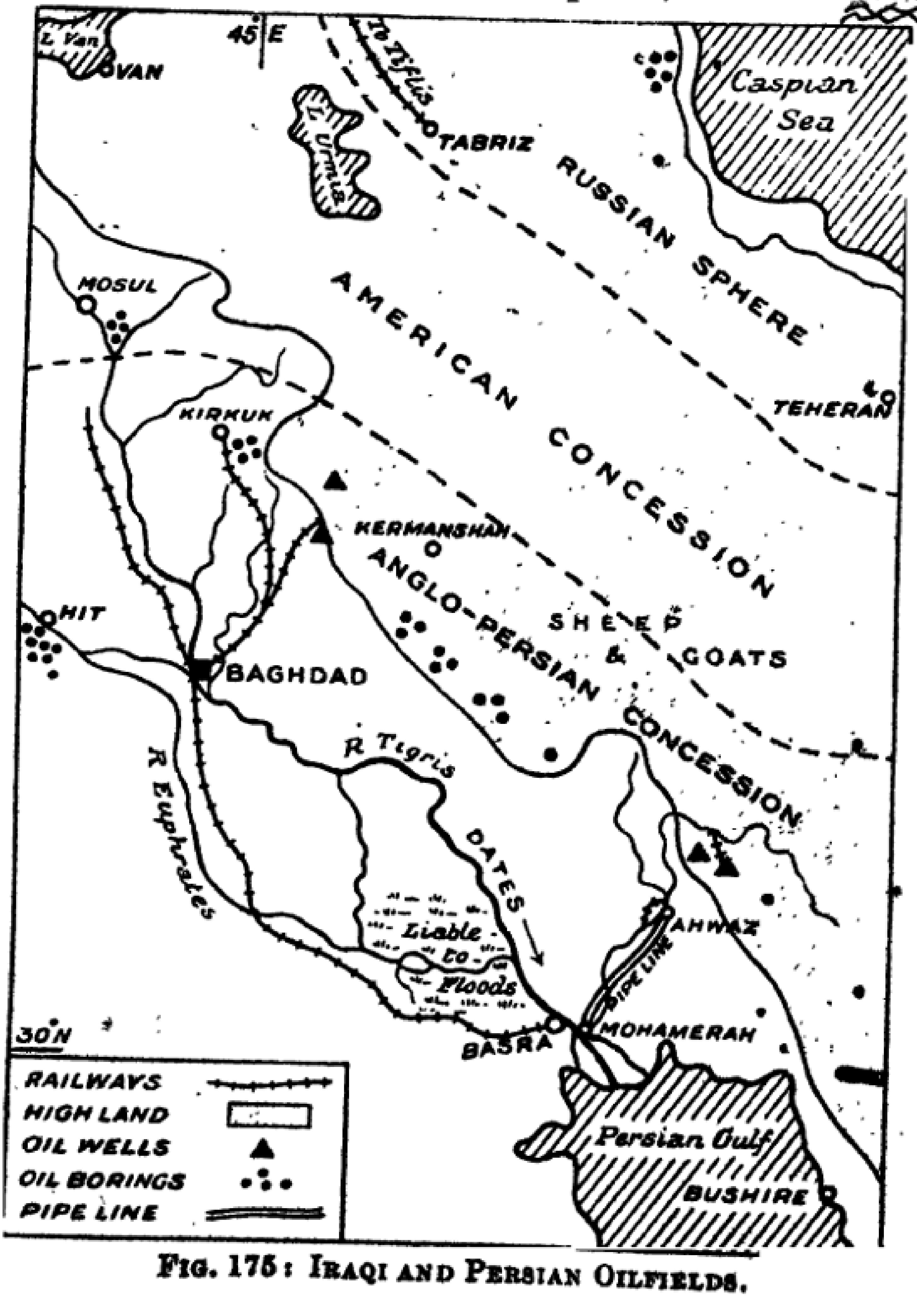


FIG. 175: IRAQI AND PERSIAN OILFIELDS.

is plentiful and is being exploited, the principal centres being to the south-east of *Mosul* (see Fig. 175). *Hit* is the centre of asphalt deposits. From Kirkuk an oil pipe-line has been laid to the Mediterranean Sea at Haifa (Palestine) and Tripolis (Syria).

Persia (Iran) = heights

Persia is bounded by the Caspian Sea, Transcaucasia and the Turkmen (or Turkoman) Republic on the north, by Turkey and Iraq on the west, by the Persian Gulf and the Gulf of Oman on the south, and by Afghanistan and Baluchistan on the east. The population is estimated at 10,000,000 and the total area is about 628,000 sq. miles.

The country consists of a lofty *plateau*, a large part of which is desert and a lesser area steppeland. The climate is of the extreme type, with a negligible rainfall except in the lands bordering the Caspian Sea and the Persian Gulf.

The rearing of stock, producing wool and hair, gives rise to a famous hand-made carpet industry. Agriculture can be carried on successfully only with the aid of irrigation, except in the Caspian provinces. Wheat is the chief crop, and with barley and millets is widely cultivated. Rice, cotton, tobacco and fruits also are grown.

The production of petroleum is a leading industry, the centres of production being the districts of *Kermanshah* and *Ahwaz* (see Fig. 175). The crude oil is carried by pipe-line from Ahwaz to Mohammerah on the delta at the head of the Persian Gulf. There are also considerable undeveloped deposits of coal, iron, copper, lead, nickel and other minerals.

The principal exports are petroleum (60 per cent. of the total), carpets, fruits and cotton, while the main imports are cotton goods (40 per cent.), sugar, motor-cars, tea and machinery.

Afghanistan

Afghanistan is bordered on the west by Persia, on the north by the U.S.S.R. and on the east and south by India. It has a total area of about 270,000 sq. miles and an estimated population of about 12,000,000.

The country consists of a mountainous plateau with the Hindu Kush range running from north-east to south-west. Extremes of climate are experienced, with summer rain and winter snow.

Much of the country is too mountainous and too dry for agriculture, but many of the river valleys are fertile and produce tobacco, medicinal plants, vegetables, fruits, wheat, barley, rice, millet and cotton with the aid of irrigation. Preserved fruits are exported in large quantities. Sheep, camels and horses are reared. The sheep provide wool and skins for clothing and for export, whilst the grease of the tail is used as a substitute for butter.

There is much mineral wealth, including copper, lead, iron, coal and silver, but it is not much developed. Comparatively easy communication with India by the *Khyber* and *Bolan* passes (see Fig. 176) has tended to encourage trade, but the unsettled nature of the inhabitants prevents development.

Communications and Towns of S.W. Asia

The Anatolian Railway runs from near *Scutari* (the Turkish port on the Asiatic side of the Bosporus opposite Istanbul) to *Konia*, whence the route is continued by the Baghdad Railway to *Adana*, *Aleppo* and *Nisibin*, near *Mosul* in Iraq at the head of the wide valley of the Tigris. About 100 miles south of Mosul a line runs to *Baghdad* (the capital of Iraq, situated on the Tigris at the centre of the valley), and thence the line follows the Euphrates to *Basra*, the Iraqi port situated near the junction of the Tigris and Euphrates.

Branches of the Anatolian Railway run east to *Angora* (the capital of Turkey) and *Kaisariya* and west to *Smyrna*, the Turkish port on the Aegean Sea, whilst the Pilgrim Railway leaves the Baghdad Railway at Aleppo and runs to *Damascus* (the capital of Syria), and through Trans-Jordan to *Medina*, near the Red Sea, in Arabia. A branch line joins Damascus to *Beirut*, a port on the Mediterranean and the capital of Lebanon.

Haifa, *Jaffa* and *Gaza* (three Palestine ports situated east of Suez) are connected by rail with the Suez canal, while a short railway runs inland from Jaffa to *Jerusalem*, the capital of Palestine. Haifa, where the harbour has recently been greatly enlarged, is likely to increase in importance rapidly. It has the only sheltered harbour in Palestine and is a terminus of the pipe-line from Iraq. It already has a large export of oranges and the export of grape-fruit is increasing, whilst another export which may assume importance is that of potash from the Dead Sea salts.

A railway is being constructed to join the Caspian Sea with the Persian Gulf. The sections from *Bendergaz* on the Caspian Sea to *Sari* and from *Shapur* on the Persian Gulf to *Dizful*, are already completed. The capital of Persia is *Teheran*, in the north, and that of Afghanistan is *Kabul*, which lies at the western end of the Khyber Pass. *Bushire*, on the Persian Gulf, is the chief port of Persia.

INDIA

India is a triangular shaped peninsula jutting south from the Himalayas to the Indian Ocean. It is shut off from the land mass of northern Asia by the vast Himalayas, the highest mountains in the world, and is bounded on the west by Afghanistan and the Arabian Sea; on the south by the Indian Ocean; and on the east by China, Indo-China and the Bay of Bengal. The political divisions of this land mass, which is almost a continent in itself, are :—

1. THE INDIAN EMPIRE, which comprises nearly the whole of the area, and includes *British India, i.e.,* those states controlled directly by Britain, and the *Native States* (562 in number, with a total area of about 700,000 sq. miles), which are indirectly under British control. These two together have a total area of 1,808,679 square miles and a population of 353,000,000.

The Empire includes also the *Andaman* and *Nicobar Islands* in the Bay of Bengal; the *Laccadive* and *Minicoy Islands* off the south-west coast; *Aden*, *Perim*, the island protectorates of *Sokotra* and *Bahrein*, together with various short strips along the Arabian coast from Aden to the Persian Gulf.

2. THE INDEPENDENT STATES of *Nepal* and *Bhutan* in the north-east. The former has an area of 54,000 sq. miles and a population of 5,600,000; the latter an area of 18,000 sq. miles and a population of 300,000.

3. THE FOREIGN POSSESSIONS, which are extremely small, are divided between France and Portugal.

The French possessions are five in number, with a total area of 196 sq. miles and a total population of nearly 300,000. They include :—

Pondicherry, situated 100 miles south of Madras on the south-east coast.
Karikal, on the coast about 100 miles south of Pondicherry.
Yanaon (or Yanam), on the delta of the Godavari river.
Chandernagore, on the Hooghly a few miles north of Calcutta.
Mahé, on the south-west coast about 30 miles north of Calicut.

The Portuguese possessions in India (area 1,460 sq. miles; population 570,000) are all on the west coast. They are :—

Goa (capital—Panjim, or Nova-Goa), on the Malabar coast in the south of the Bombay Presidency.
Daman (or Damao), on the coast about 100 miles north of Bombay.
Diu, a small island situated off the south coast of the Kathiawar Peninsula.

Relief

India proper may be divided physically into four regions: (1) the Northern Mountains; (2) the Indo-Gangetic Plain; (3) the Deccan and (4) Burma.

THE NORTHERN MOUNTAINS form a mighty barrier more than 2,000 miles in length, of which over 1,250 miles are accounted for by the Himalayas. The latter, which lie in the north-east and rise in many places to considerably more than 18,000 ft., contain *Mount Everest*, 29,002 ft., the highest peak in the world. This range is remarkably continuous and forms an effective bar to communication between India and Central Asia. In the north-west is a complex system of mountains occupying the North-West Frontier and Baluchistan. They consist of high, arid ridges and isolated valleys inhabited by warlike tribes which have constantly to be held in check by military force. The only relatively low passes of the northern mountains are situated here, the chief being the *Khyber Pass*, on the North-West Frontier, and the *Bolan Pass*, in Baluchistan. Through these passes communication with Afghanistan and Persia is possible (see Fig. 176).

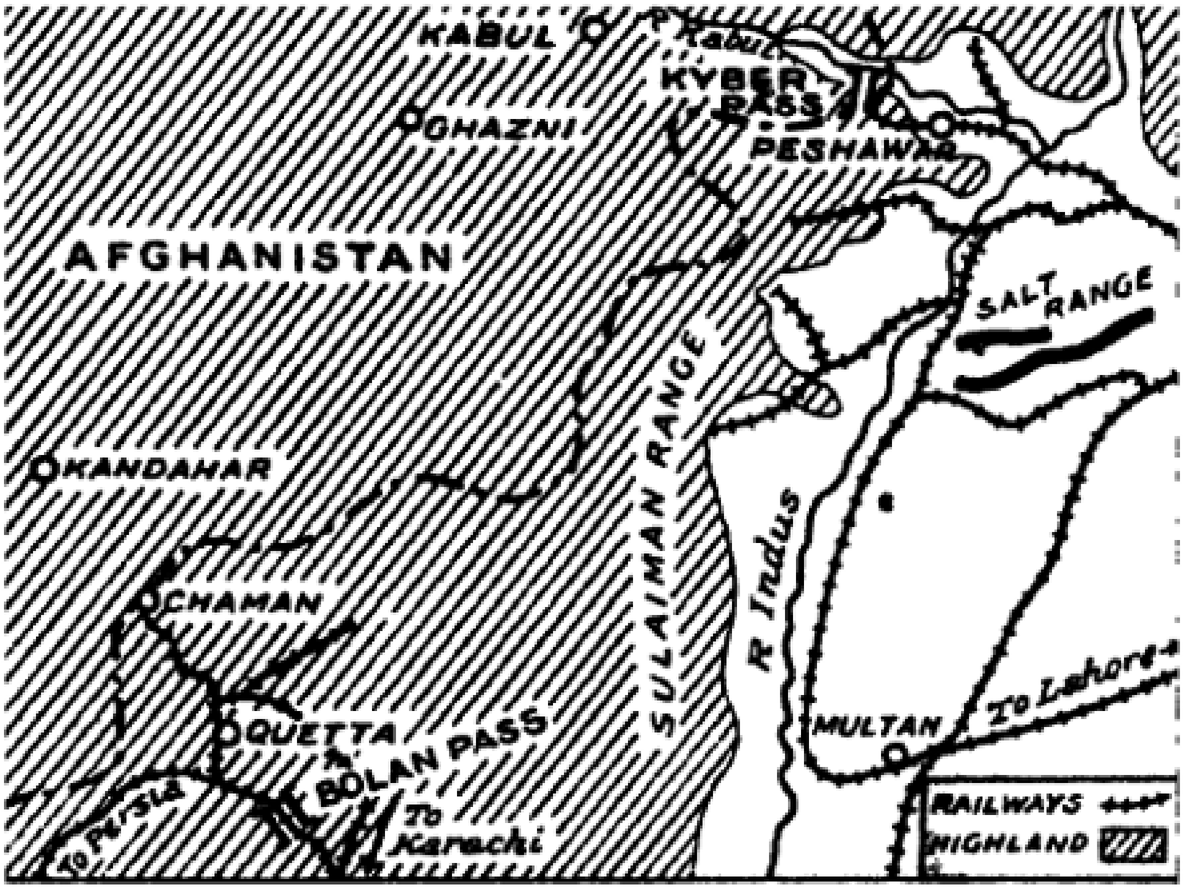


FIG. 176: PASSES OF N.W. INDIA.

Note:—" Kyber " can be spelt " Khyber ".

THE INDO-GANGETIC PLAIN comprises the wide expanse of low land extending right across the north of Peninsular India, which is drained by the *Ganges* and the *Indus* and their many tributaries. The plain is nowhere more than 600 feet high except where a low northward continuation of the Deccan separates the two river basins. The plain has been covered with alluvium washed down from the mountains, and the great fertility of the soil, combined with the ease of irrigation, has made this region the most densely populated part of India, containing almost half the total population.

The *Ganges*, the principal river of India, rises in the Himalayas, and, after forcing its way through the mountains, flows south-west and then south-east to Allahabad, where it receives the *Jumna* on its right bank. After crossing the plains of Bihar, the river bends sharply southward and divides into numerous branches, reaching the Bay of Bengal by means of a great delta. The western mouth of distributary, known as the *Hooghly*, is the great channel of navigation. The is navigable to the Himalayan foothills and ocean steamers can ascend to Calcutta. It has a great many tributaries which are also navigable.

The *Indus* rises on the north side of the central Himalayas. Flowing first north-westward between that range and the high tableland of Tibet, it then turns south between the Himalayas and the Hindu Kush, finally entering the Arabian Sea through a large delta with many branches or distributaries.

All the large tributaries of this river are on its left (east) bank. The *Sutlej*, the most important, also rises in the Himalayas, as do the *Ravi*, *Chenab*, *Jhelum* and *Bias*, all of which join the Sutlej before it meets the main river. The only right bank tributary of note is the *Kabul*, a wild mountain torrent from Afghanistan, which follows so difficult a course that its valley is not available as a pass from India to Afghanistan. There are no important tributaries in the lower half of the course of the Indus.

The Indus is navigable up to the gorges that extend to the confluence of the Kabul tributary, but owing to the shifting sand-shoals in its bed navigation is difficult and is of very slight commercial importance. Of the five tributaries which give the name of Punjab ("Land of Five Rivers") to the area they traverse, the Sutlej and the Jhelum are the most important and both are navigable for a long distance. The Chenab is important mainly for supplying large irrigation works.

To the east of the lower Indus lies the desert of *Thar* (otherwise called the Indian Desert) which stretches as far as the Aravalli Hills.

The *Brahmaputra*, like the Indus, rises north of the Himalayas but flows eastward. After making a great bend round the end of the mountain mass, it flows west and then south through the provinces of Eastern Bengal and Assam into the Bay of Bengal, so close to the delta of the Ganges that the distributaries of the two great rivers are connected.

THE DECCAN is a large plateau with an average height of 2,000 ft., occupying a large part of southern India. It stretches from the Indo-Gangetic plain southward and is tilted from west to east, *i.e.*, it slopes gently to the Bay of Bengal from the highest part bordering the Arabian Sea. The rivers therefore generally flow east into the Bay, though two important ones, the *Narbada* and *Tapti* in the north, flow west to the Gulf of Cambay in the Arabian Sea. None of the rivers is navigable for any great distance.

The western edge of the Deccan is formed by the *Western Ghats*, which rise steeply from the narrow coastal plain and have always been a great hindrance to communication from the coast to the interior, the only important routes being *via* the *Palghat*, the *Thalghat* and the *Bhorghat* passes (see Fig. 177). The eastern edge, formed by the *Eastern Ghats*, is much lower and falls to a wide coastal plain which broadens out especially near the mouths of the rivers, most of which have extensive deltas, *e.g.*, the *Mahanadi*, the *Godavari* and the *Kistna*. From the northern edge of the plateau, several rivers flow northwards across the northern plain, notably the *Son* and *Chambal*.

The general rolling character of the surface of Peninsular India is relieved by a number of ridges running eastwards from the Western Ghats.

These are highest in the south, where the *Nilgiri Hills* and the *Cardamom Hills*, separated by the low Palghat Pass, reach a height of nearly 9,000 feet. In the north are the *Satpura Hills*, separating the Tapti and Narbada rivers, and to the north of the Narbada are the *Vindhya Hills*. In the extreme north-west are the *Aravalli Hills*.

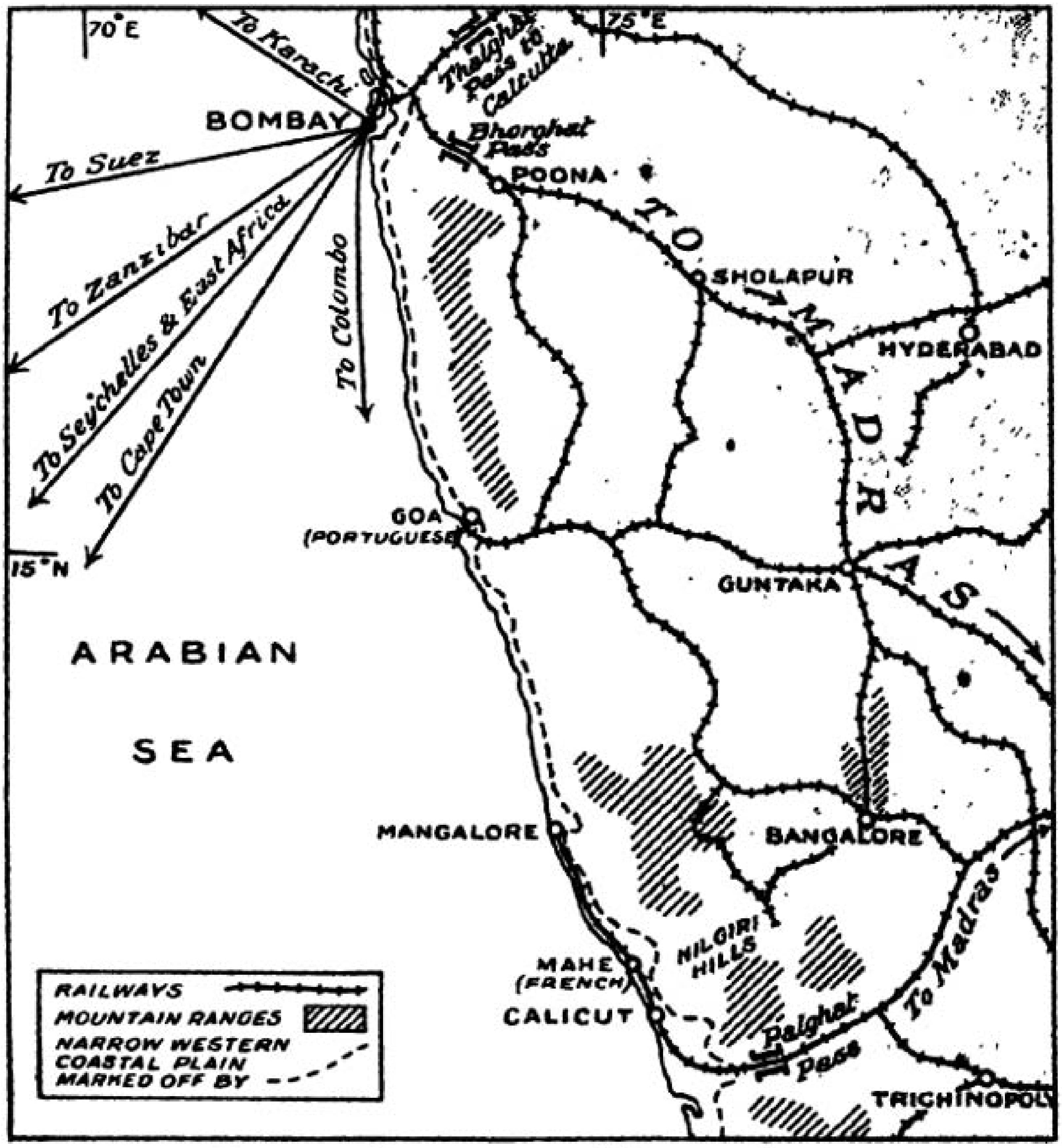


FIG. 177: PASSES OF THE WESTERN GHATS.

The most fertile parts of the Deccan are the river valleys and deltas, and a large area of deep, rich, volcanic soils in the north-west.

BURMA is a country of parallel mountain ridges and valleys running in a general north-south direction, the *Irawadi* valley being much the most important region. Indeed, apart from the mountainous Shan States on the east and the high Tenasserim Plateau to the south, Burma consists almost entirely of the drainage area of the Irawadi. This great river flows from the mountain mass in the north through broad plains bordered by high mountains. On the west of its important tributary, the *Chindwin*, are the *Patkoi*, *Naga*, *Manipur* and *Chin Hills*, while below the confluence of the two rivers are the mountains known as *Arakan Yoma*, separating the valley from the coast. On the east the Irawadi is separated from the *Salween*, the second river of Burma, by the *Kachin Hills* and the *Shan Plateau*, and from the *Sittang* further south by the *Pegu Yoma*.

The Irawadi is navigable from its mouth (to the east of which stands Rangoon, the capital) far past Mandalay to Bhamo, a distance of over 900 miles, and its tributaries, the *Chindwin*, the *Shweli* and the *Myitnge*, also are navigable.

Climate of India and Burma

India, on the whole, has a *monsoon* climate. It is, in fact, the most typical of the monsoon countries and the monsoons have a great effect on the lives of the Indian people. The climatic seasons have been grouped by the Government of India Meteorological Department into—(1) THE NORTH-EAST MONSOON SEASON : (*a*) the *cold weather season* in January and February, (*b*) the *hot weather season* from March to mid-June ; (2) THE SOUTH-WEST MONSOON SEASON : (*a*) the *season of general rains* from mid-June to mid-September, (*b*) the *season of the retreating monsoon* from mid-September to December.

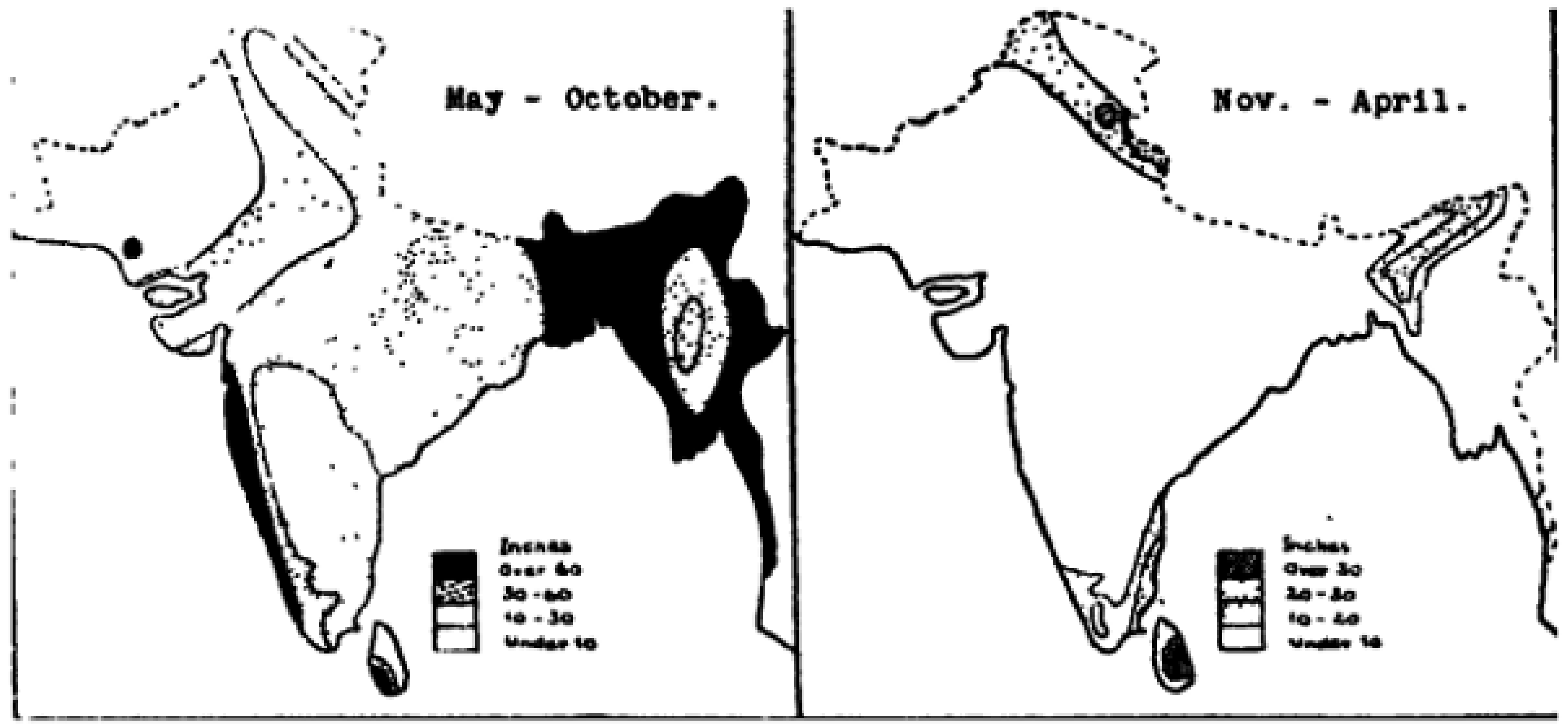


FIG. 178 : RAINFALL OF INDIA.

COLD WEATHER SEASON. As pressure is highest over the relatively cold plains of the north-west, winds (N.E. Monsoon) blow outwards and the cold season weather is therefore fine, cloudless and generally dry, but rain occurs in the north-west from shallow cyclones or storms which reach India from the west.

HOT WEATHER SEASON. From March to May temperatures rise and a low pressure belt begins to form over the land. As a result of great convection, cloudiness increases, especially in the south, which receives rain from violent thunderstorms, but otherwise there is a total lack of rain in the hot season.

THE SEASON OF GENERAL RAINS. By the middle of June the low pressure area has become much more intense because of the rise in temperature, and the South-East Trades are drawn towards India as the wet South-West Monsoon.

The direction of the South-West Monsoon over India is influenced mainly by the shape of the land and by relief. The wind is cut in two by the "apex" of the peninsula, and thus there are two main currents. The Western current strikes the Western Ghats, giving heavy rainfall between Bombay and Cochin. The eastern current strikes the hills of Burma and Assam, where the coastal areas receive a rainfall similar to that of the west coast. The Himalayas deflect the monsoon winds up the Ganges valley and heavy rain occurs in the east, gradually decreasing westwards as the winds are deprived of their moisture.

An important exception occurs in the north-west, which during the rainy season is dry because of its situation in an angle of the mountains, where very little moist air can blow into it, and also because the possibility of rain is limited by the presence of a warm, dry upper current of wind coming from the west.

Apart from the dry north-west area, the temperature over the whole country falls in the rainy season and the diurnal range of temperature also decreases as a result of the heavy rainfall.

THE SEASON OF THE RETREATING MONSOON. As autumn approaches, the South-West Monsoon gradually dies away. Tropical cyclones, which develop to the south-east near the Andaman Islands, strike the south-east coast and bring rain, but elsewhere in India the season of the retreating monsoon is dry.

Industries of India

FORESTRY.—Forests are extensive in Burma, Assam, the Central Provinces, Madras, Bombay and Bengal. Teak—renowned for its water resisting properties—is the principal wood, especially in Burma, where the logs are floated down the Irawadi to Rangoon for export. Sal, ironwood, sandalwood, rosewood, ebony, oak and bamboo are other valuable trees.

Other forest products include (*a*) cutch or catechu, an extract obtained from the chopped wood of a species of acacia, and widely used for dyeing and tanning; and (*b*) myrobalams, a source of tanning material also widely used in India and obtained as the fruit of a tree abundant in Indian forests. Although much timber is exported from both India and Burma, the amount is small compared with that used for home consumption.

AGRICULTURE, by far the most important industry of India, supports about two-thirds of the total population. A failure of the wet monsoon formerly caused disastrous famines, but this has been largely provided against, thanks to British incentive and supervision, by the construction of extensive irrigation schemes and the development of railways.

[*By Courtesy of the National Geographic Society* (*U.S.A.*)

AN INDIAN TREADMILL USED FOR IRRIGATION

The primitive and laborious method by which this Indian family raise water for their thirsty fields can truly be described as hard labour, and the rough grass shelter affords little protection from the scorching sun.

There are now in India over 50 million acres of irrigated land. The tank system of irrigation is prevalent in the peninsula and is being extended in the north-west of the country. The method consists essentially in the formation of large reservoirs in the nature of artificial lakes by closing up natural valleys with huge dams of concrete and stonework. The *canal* type of irrigation is most extensively utilised, particularly on the northern plains. This is carried out either by *perennial* canals which draw water from rivers throughout the year, or by *inundation* canals which convey water only in flood periods. In the alluvial plains in the north large areas are irrigated by *wells*, from which the water is laboriously raised in buckets drawn up by the peasants or by oxen.

Rice is the most important crop, the chief food grain of the people and the most important export of Burma. It flourishes in the wet, hot, easily-flooded regions of the Ganges and Brahmaputra valleys and delta, in the coastal plains (*e.g.* the Malabar and Coromandel coasts), in Sind, round the Indus delta (under irrigation), and in the river valleys and deltas of Burma. Millet is grown as a food crop in drier areas, as in the higher plains and in the Deccan, and wheat (another "dry-zone" crop) as a winter crop under irrigation in the Punjab and United Provinces. Cotton, the principal commercial crop, is cultivated in the famous black soil region of the north-west Deccan, as well as in the upper Ganges and Indus valleys under irrigation, and in southern India. Oil seeds are widely cultivated; jute, which needs much heat and

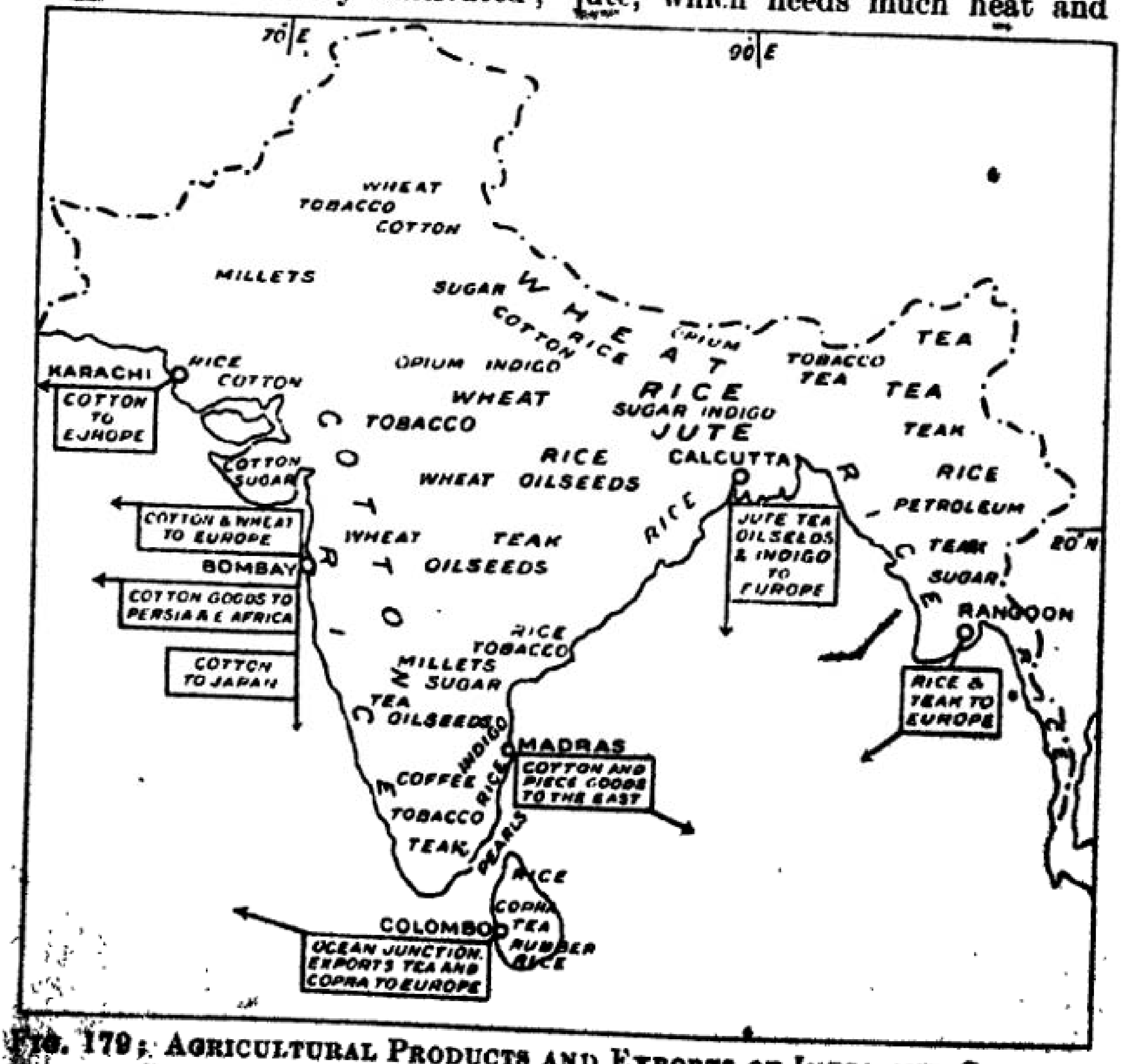


FIG. 179. AGRICULTURAL PRODUCTS AND EXPORTS OF INDIA AND CEYLON.

moisture, is important in the Ganges delta, and large but insufficient quantities of sugar cane are grown in the Ganges valley, particularly in the United Provinces. Tea is an extremely important crop on the hill slopes of Assam and around Darjeeling and is also grown on the Nilgiri Hills; coffee is grown in the Nilgiris, while indigo is cultivated in the Ganges valley and around Madras. Maize is produced as a subsidiary food in regions with a moderate rainfall. Other crops include opium, cinchona, spices, rubber (from the Andaman Islands), coconuts and tobacco. (Refer also to Chapters 10 and 11.)

The Pastoral Industry of India supports a large number of cattle, whilst sheep, horses, donkeys. mules, camels and goats are reared, the last for their flesh and milk. Bullocks are much used in the lower areas as beasts of burden or draught animals, while the yak is used for the same purpose in the Himalayas, and camels in the Punjab and Sind. Kashmir shawls are made from the mohair obtained from goats. Hides and skins are important export products.

Mining, when compared with agriculture, is practically undeveloped in India, and though valuable minerals such as coal, iron and manganese are abundant, they have remained almost undisturbed up to modern times. The old hand-industries carried on by the people in their homes are still predominant, so that up to the present there has been little incentive to develop the resources of the country in those raw materials required only on a large-scale by the modern factory, *viz.*, coal for power and iron for machinery. Other factors retarding development, such as lack of knowledge, of transport and of capital, have been partly overcome by the construction of railways, the development of banking and the introduction of Western industrial methods. As a result, industry is spreading and is giving rise to an increasing demand for raw materials of all kinds, including minerals.

Coal is by far the most important mineral. The Gondwana coalfields in Bihar and Orissa and in Bengal are the principal sources, the chief centres being Jherria, Raniganj, Bokaro and Giridih. Unfortunately, this coalfield suffers from the great drawback that it is a long way from the port of Bombay, where the coal could be very profitably used. Coal is worked also in Hyderabad, the Central Provinces, Central India, Assam, the Punjab, Baluchistan and Rajputana. Although the reserves of coal are known to be considerable, and the output more than sufficient for the existing requirements of the railways and the smelting and manufacturing industries, the quality is unfortunately not suitable for coking purposes, and large quantities are imported from Natal.

Iron Ore is worked near the coalfields, mainly in the Singhbhum, Mayurbhanj and Koenjhar districts of Bihar and Orissa. The output is increasing, India now being the ninth in order of world producers and next in importance to the United Kingdom of the Empire countries. It has been estimated that the undeveloped reserves of iron-ore in India compare favourably in quantity with those of the United States.

Petroleum is an important product, but the output is declining. It is obtained mainly from Burma at Yenangyaung and Singu, but the Punjab (Attock) and Assam (Digboi and other centres) also are producers. The chief oil refineries are at Rangoon, to which centre the Burmese oil is transported by pipe lines and tank steamers. There are possibilities of oil production in Baluchistan.

Mica.—India is the world's principal source of mica, the leading centres being in Bihar and Orissa and in Madras.

Manganese.—As a producer of manganese, India is second to the U.S.S.R., the chief source of supply being in the Central Provinces (see also Chapter 13).

Other Minerals include gold from Mysore (Kolar); lead, silver, copper and zinc from Bawdwin in Upper Burma ;. salt, a government monopoly, obtained mainly by the evaporation of sea water in Bombay and Madras, and from the Salt Range in the Punjab; tin from the Tenasserim area of southern Burma; and precious stones, especially rubies, from the upper Irawadi valley in Burma.

Manufactures

India's manufactures are slow in developing, but modern industrial methods are gradually gaining ground and the factory system is increasing in importance. There is a large but not very wealthy market for home-produced goods, particularly as the people are intensely keen on becoming independent of Britain and developing their own industries and government. An important factor favouring industrial development is that labour, although inefficient, is plentiful and relatively cheap.

THE COTTON INDUSTRY is the most important industry and has rapidly developed as a serious rival to Lancashire. The chief centre is Bombay, which not only has ample raw material close at hand on the Deccan, but also has the advantage of cheap and plentiful hydro-electric power from the rapid streams of the Western Ghats and an ample supply of cheap labour. The climate is sufficiently humid during the wet season, but during the remainder of the year the air in the mills has to be kept moist by artificial means. Ahmedabad, in Gujarat, ranks second to Bombay as a cotton centre.

THE JUTE INDUSTRY is centred mainly at Howrah, a suburb of Calcutta, the natural centre of the industry. The great jute-producing area of the Ganges delta, the Sundarbans, is close at hand; coal is easily available from the Gondwana fields; and cheap labour is abundant. Large numbers of gunny bags are made and exported to countries bordering the Indian and Pacific Oceans, while many others are used for packing Indian produce for export.

THE IRON AND STEEL INDUSTRY, though still of comparatively small dimensions, is gradually expanding. The industry is assisted by protective tariffs and bounties, but is labouring under difficulties such as

(i) the lack of suitable coking coal, a disadvantage which it is hoped may be overcome by the use of charcoal; (ii) the powdery nature of much of the available haematite; and (iii) the effective competition from other countries. The most important centre of the industry is Jamshedpur, which produces pig iron, steel rails and steel plates. In other parts of India railway and tramway workshops employ large numbers of people, but the necessary materials are mainly imported and the chief function of the workshops is that of repairing rolling stock.

Hand-loom Industries are widespread throughout the country and employ millions of people. The industries produce a variety of articles, including the muslins and damasks of northern India, the calicoes and chintzes of the south, the silks of Gujarat, Benares, Amritsar and Mandalay, the carpets of Amritsar and the famous Kashmir shawls.

Other Industries include numerous flour mills in the Punjab; rice, saw and oil mills in Burma and elsewhere; tea factories, chiefly in Assam; sugar factories, silk mills and indigo factories, chiefly in Bengal; petroleum refineries in Burma; engineering shops at Calcutta and Howrah; tanneries and leather works at Cawnpore, Bombay and Madras; printing works, chiefly in Bengal and Madras; and tile and brick factories, chiefly in the Ganges Valley.

Communications

Although many of the great rivers of India are navigable for long distances (see pages 289-290), they are of local importance only. The Indians, unlike the Chinese, do not take easily to water navigation, so that communication and commercial development are closely linked up with the expansion of the railway system which, naturally, is most highly developed in the lowland areas, particularly in the Ganges plain.

The Great Indian Peninsular Railway (G.I.P.R.) makes use of the Bhorghat and Thalghat Gaps to join Bombay with Madras (*via* Poona) and Calcutta (*via* Nagpur) respectively. Calicut is also joined to Madras *via* the Palghat Gap (see Fig. 177). The East Indian Railway connects the G.I.P.R. with Allahabad, whence it runs north to Delhi and to Ambala in the Punjab and south to Calcutta, whilst the Bengal-Nagpur Railway connects Nagpur to Calcutta. Madras is linked with Calcutta, Bombay with Delhi, and Karachi with Quetta and with Multan and Lahore. Peshawar is joined to Lahore and Delhi.

Commerce of India

India's principal *exports* are raw cotton, manufactured jute, tea, rice (from Burma), raw jute, oil seeds, hides and skins. The chief *imports* consist of cotton goods, machinery, metals and ores, oils, sugar, hardware, provisions, paper, vehicles, woollens and dyes. Over 30 per cent. of the trade is with the United Kingdom, who receives mainly tea (about 30 per cent. of the total), leather and hides, jute and jute manufactures, sending in return chiefly cotton goods, machinery, iron and steel goods, chemicals and motor-cars.

Natural Regions of India

The four main physical divisions of India and Burma serve as a basis for the division of the country into natural regions. The climatic sub-divisions of each of the regions are as follows :—

1. THE MOUNTAINOUS REGION, divided into—
   - (a) The North-Western Ranges.
   - (b) The Himalayas and Eastern Mountain Wall.
2. THE PLAIN OF HINDUSTAN, divided into—
   - (a) The Indus Plain : (i) The Central Punjab ;
     (ii) The Lower Indus Valley.
   - (b) The Upper Ganges Basin.
   - (c) The Middle Ganges Basin.
   - (d) The Lower Ganges and Brahmaputra Basins, including the delta.
3. PENINSULAR INDIA, with five divisions—
   - (a) The West Coast.
   - (b) The North-West Deccan.
   - (c) The North-East Deccan.
   - (d) The Central and Southern Deccan.
   - (e) The East Coast.
4. BURMA, divided into—
   - (a) The Arakan and Tenasserim Coastal Region.
   - (b) The Shan States.
   - (c) The Irawadi Basin.

THE NORTH-WEST RANGES constitute a frontier land with low rainfall and poor pasture. Millet, wheat and barley are grown with the aid of irrigation, while sheep and cattle are reared. The region is inhabited by poor pastoral tribes. *Peshawar*, commanding the Khyber Pass, is the chief town.

THE HIMALAYAS AND EASTERN MOUNTAIN WALL are largely forested, the upper heights having temperate trees, and the lower slopes dense tropical forests and jungles. In the Vale of Kashmir fruit, silk and wool (from mountain goats) are produced. Some of the wool is exported and some made into the famous "Kashmir shawls," the chief centre of this industry being *Srinagar*, situated in the Vale of Kashmir on the river Jhelum. The hill slopes of the east are used for the production of tea, while rice is cultivated in the wetter and warmer valleys.

Simla, on the Himalayan foothills north of Delhi, is the summer residence for northern India.

THE CENTRAL PUNJAB has extensive irrigation schemes for the cultivation of cereals and cotton. Wheat, grain and barley are grown as winter crops and rice, maize and millet as summer crops. This is the leading wheat producing area of India but very little is exported except in very favourable years. The great "money" or export crop is cotton, shipped from Karachi. In the non-irrigated areas sheep and goats are reared.

Lahore, on the Ravi, is the great wheat and cotton centre and is also a railway centre. *Amritsar*, a few miles to the east, is a noted centre for shawls, cottons and silks. *Multan*, near the Chenab, is an agricultural centre.

THE LOWER INDUS VALLEY, including the Thar Desert, is a very dry region which is being developed with the aid of irrigation from the Indus and its distributaries, cotton and grains being the chief crops.

In this area millions of acres of hitherto unproductive land will be

[Photo by W. F. Taylor.

A NATIVE MARKET AT LAHORE.

The rival pottery sellers squat side by side and pass the time in gossip as they wait for customers.

brought under cultivation as a result of the great irrigation scheme based on the Sukkur Barrage across the Indus.

Karachi, near the delta of the Indus, is the port for the whole of the Indus basin (see page 231).

THE UPPER GANGES has less than 40 ins. of rainfall and therefore irrigation is usually necessary for agriculture. The chief irrigated crops are wheat (the most important), barley and rice, with millet as the leading " dry " crop. Other products include maize, cotton, sugar and grain, whilst cattle are important.

Delhi, the capital of India, lies on the Jumna on the higher land separating the Indus and Ganges plains. It is the centre of a thickly populated district with good road and rail connections to all parts of the country.

Lucknow, on a tributary of the Ganges, is a commercial town with many native industries and extensive railway workshops. *Cawnpore*, on the Ganges practically in the centre of northern India, is a prominent cotton and leather manufacturing town and a great commercial centre. *Agra*, in the west of the United Provinces on the Jumna, is an important railway junction and contains the famous Taj Mahal mosque, so beloved by tourists. *Allahabad*, at the junction of the Ganges and Jumna, is an important cotton, sugar and indigo centre.

THE MIDDLE GANGES has a higher rainfall and irrigation is employed largely as a precaution against a failure of the monsoons. Rice is the chief crop, increasing in importance towards the wetter east. Wheat, barley, maize, millet, oilseeds and sugar are other crops of importance.

Benares, the most sacred city of the Hindus, is one of the chief towns of northern India. It lies on the Ganges in the east of the United Provinces and has many native industries.

THE LOWER GANGES AND BRAHMAPUTRA area has an abundant rainfall. It is densely populated and produces about half the food grown in India. The leading crops are rice, tobacco, sugar and opium, with jute in the deltaic region of the Ganges (Sundarbans) and tea in the Assam lowlands and on the hill slopes.

The port for this region is *Calcutta* on the Hooghly, the main distributary of the Ganges (see page 230). Its suburb, *Howrah*, is a jute manufacturing town and a railway centre. *Patna*, near the junction of the Son and Ganges, is a collecting centre, but has lost much of its trade to Calcutta.

THE WEST COAST region is a narrow coastal plain backed by the Western Ghats and it receives the full force of the wet monsoons. Rice, sugar cane, cotton, and mango are produced, while there are rubber plantations in the south. The hills are covered with dense evergreen forests, teak and sandalwood being the most important timbers.

Bombay is the port and commercial centre of the region (see page 231).

THE NORTH-WEST DECCAN comprises the "Black Soil" cotton-growing region, which supplies the mills of Bombay and exports through that port mainly to Japan and China. Wheat and millet also are grown.

Ahmedabad, the fourth largest inland town of India, is situated 50 miles north-east of the Gulf of Cambay. It is next to Bombay in importance as a cotton manufacturing centre. *Poona*, on the G.I.P.R. south-east of Bombay where the line emerges from the Bhorghat Pass, is a military centre and, on account of its altitude, the summer residence of the Bombay Presidency.

THE NORTH-EAST DECCAN is mainly important for its mineral wealth, which includes coal, iron and manganese, with *Jamshedpur* as the centre of the iron industry. The rainfall is sufficient for the cultivation of grains, of which millet is the most important.

THE CENTRAL AND SOUTHERN DECCAN is dry and tank irrigation has to be practised to make cultivation possible.

Hyderabad, the capital of the state of that name is situated in the heart of the fertile district of the Deccan, where millet, rice oil-seeds, cotton and sugar-cane are produced. The city has good rail connections with Bombay, Calcutta and Madras. Tea and coffee are grown on the Nilgiri Hills.

THE EAST COAST receives rainfall in the cool autumn months when the evaporation due to heat is not as marked as it is elsewhere. In the wetter and hotter parts rubber, coconuts, spices and bananas are cultivated; elsewhere rice, millet and good quality cotton are grown.

Madras (see page 232) is the port of the region and the main outlet for its products.

THE ARAKAN AND TENASSERIM COASTAL REGION of Burma consists of two narrow lowland areas, the first backed by the Arakan Yoma and the second (Tenasserim) by the mountains of the Malay Peninsula. In both cases the coast is dotted with islands. The mountainous nature of much of the land causes only one-tenth of the total area to be cultivated. Rice is the leading crop, the heavy rainfall, everywhere over 100 inches annually, and the high temperature being favourable to its growth. In Tenasserim rubber also is cultivated and tin, coal and wolfram are mined.

Arkyab, on the Bay of Bengal in the north, and *Moulmein*, near the mouth of the Salween in the north of the Gulf of Martaban, are the ports and chief towns.

THE SHAN STATES comprise a plateau region cut by the Salween and other rivers. It contains grassland areas and valleys capable of development but at present in a very backward state. The Shan tribes rear cattle, sheep and goats, and cultivate rice and wheat, whilst there is abundant mineral wealth largely unexploited. The region contains no important towns.

THE IRAWADI BASIN is the most important region of Burma. In the north the rainfall is not very plentiful, but irrigation is employed in parts. Rice, millet, beans, cotton and ground-nuts are cultivated, whilst the important oilfields of Yenangyaung and Singu and the rubies of Mogok are situated here. The lower Irawadi includes the Irawadi delta, the valley of the Sittang and the forested slopes of the Pegu Yoma. It receives a greater rainfall than the northern part and is the great teak and rice region of Burma.

Rangoon (see page 232) is the chief port and the capital of Burma. *Mandalay*, in the upper valley of the Irawadi, is a collecting centre and is in rail communication with Rangoon. It has many native industries and is the centre of the Buddhist faith in India.

CEYLON

Ceylon, situated off the south-east coast of India, has an area of 25,332 sq. miles supporting a population of about 5½ millions. The island consists of gently undulating plains rising in the south to over 8,000 ft. Thanks to Ceylon's insularity and its position in the track of both monsoons, it has an equable climate, with no temperature extremes, and has rain at all seasons.

Much of the island is covered by beautiful tropical vegetation and agriculture is the most important industry. At one time coffee was the chief product, but disease destroyed the crop. Tea is now the chief crop, Ceylon being third in importance of the tea-producing countries. Rice also is cultivated, but the quantity produced is insufficient for home needs, although it occupies more land than tea. The production of rubber is now almost as important as that of tea, but coconut plantations occupy the largest area of all the agricultural products. Cocoa is an expanding crop, while minor crops include cinnamon, areca nuts, citronella oils, cardamoms and vanilla. Gems and plumbago are mined in considerable quantities.

Colombo, situated on the south-west coast, is the capital and the chief port (see page 233). From here railway lines run to the other towns of the island, *Jaffna, Galle* and *Kandy*, while Adam's Bridge, a natural viaduct, will one day carry a line to the Indian mainland. Tea, rubber, coconuts, coconut products, cinnamon, cocoa, areca nuts, citronella, cardamoms, vanilla and plumbago are *exported:* while rice, cotton goods, coal, coke, manures and sugar are *imported.* Great Britain dominates the export trade, taking the bulk of the tea which accounts for about 60 per cent. of the total exports of Ceylon. Britain's share of the import trade is less than 20 per cent. of the total.

THE MALDIVE ISLANDS, a group of 13 coral islets lying 400 miles south-west of Ceylon, are a dependency of the colony. They are clothed with coconut palms and export coconuts, coir and copra.

CHINESE TERRITORIES

Area: about 4,000,000 sq. miles. *Population*: about 465,000,000.

The Chinese Territories comprise *China*, *Sinkiang*, *Mongolia* and *Tibet*. This large land mass is bounded by the U.S.S.R. on the north and west, by India and Indo-China on the south, and by Manchuria, Corea and the Chinese Seas of the Pacific on the east.

China

Although mountains cover a large part of China, particularly in the north-west, west and south-west, there are considerable lowland areas. In the north-east is the Great Plain, stretching from the Mongolian border to the *Yangtse-kiang*, and including the *Hwang-ho* basin. In the south is the valley of the *Si-kiang*. These three river basins constitute the most important parts of the country.

As is to be expected, the great size of the country and the nature of the relief cause wide variations in climate. The north and west, being high and far inland, have great extremes of temperature, while the prevailing winds (from the cold interior in winter and from the warm sea in summer) cause extremes also in the east. The south is generally less extreme, being very hot in summer, with occasional cold winters. On the whole, the rainfall of China, and especially the south, is of the monsoon type, the rain falling mainly in the summer, as in all monsoon countries. Rainfall diminishes from north to south and, owing to sea influences, from east to west. The industries, communications and towns are most conveniently considered by reference to the natural regions of the country.

Natural Regions of China

Broadly, China can be divided into seven natural regions: (1) the North-East Plain, consisting of the lower Hwang-ho valley; (2) the Shantung Peninsula; (3) the Loess Region, in the north-west; (4) the Red Basin of Szechwan, separated from (5) the Lower Yangtse Basin by the Great Gorge; (6) the South-Eastern Plateau, consisting of the provinces of Chekiang and Fokien; (7) the Si-kiang valley, in the south; and (8) the Yunnan Plateau in the south-west.

THE LOWER HWANG-HO VALLEY.—The Hwang-ho rises in the remote heights of Kansu, becoming important on the plain, where its course is slow and tortuous. It has changed its course several times. Before 1852 it reached the sea below the Shantung peninsula, but it now discharges its waters to the north of that peninsula. The soil consists of river alluvium and is very fertile under abundant rainfall or irrigation. The chief food crops are wheat, millet, peas and beans. Cotton also is grown and silk is produced. Industries include the manufacture of woollens, cottons, dyes, silk and straw plaits, and distilling.

Tientsin, on the Pei-ho, is the chief port of northern China and is at the northern end of the Great Imperial or Grand Canal which crosses the plain of North China to link up with the Hwang-ho, the Yangtse-kiang and Hangchow. It serves also as the port for *Peiping* (Pekin), the former capital of China. Peiping is joined by rail northwards *via* Mukden to the Trans-Siberian railway, and southwards (*a*) *via* Nanking to Shanghai, and (*b*) *via* Hankow towards Canton and Hong Kong.

THE SHANTUNG PENINSULA is mainly mountainous, but agriculture is important in the fertile valleys, sometimes with the aid of irrigation. Wheat, millet and silk are the chief products and there are deposits of coal. *Chefoo* is the chief port and trading centre.

THE LOESS REGION consists of the upper basin of the Hwang-ho. The loess soil is extremely fertile, but owing to the irregularity of the rainfall and the consequent difficulty of irrigating the land, there is always serious danger of famine. Wheat, barley, maize, millet, cotton, tobacco and groundnuts are cultivated. Minerals are important, the chief being coal and iron in Shansi and Kansu.

THE RED BASIN of Szechwan, in the upper Yangtse valley, is completely hemmed in by mountains and almost completely cut off from the rest of China by the narrow gorge between Ichang and Kweichow. In spite of this, it is one of the most densely populated areas of the world owing to its fertile soil and facilities for irrigation. Further, its climate is equable owing to the shelter afforded, particularly in winter, by the surrounding highlands. Rice, silk, maize, wheat, sugar, tobacco, beans, oranges and hemp are the leading products, and coal is present in large quantities.

THE LOWER YANGTSE VALLEY.—The Yangtse-kiang, the largest river of China, rises in the mountains of Tibet, and after a course of 3,200 miles, first south-east, then north-east and finally east, reaches the sea in a wide estuary which begins 50 miles below *Nanking*, the present capital of China. The Yangtse-kiang is easily the most important river in Eastern Asia, for it flows through some of the most fertile and densely populated parts of China, and is of great value as a means of transport. The river is navigable by steamers for 1,000 miles to *Ichang*, but above that town for 120 miles navigation is impeded, even for small boats, by falls and rapids.

The lower part of its basin, from Ichang, is a low plain of great fertility. The northern part, consisting of the provinces of Hupeh, Anhwei and Kiangsu, produce barley, wheat and cotton; to the south, in the lower parts of Hunan and Kiangsi, rice, tea and oil-seeds are the main crops. The delta is the principal silk-producing region of the country and has a large production of rice and cotton.

Coal is found in Hunan and Kiangsi, iron in Hupeh, copper in Kiangsi and antimony in Hunan. Gold, silver and precious stones are widely distributed. Manufactures include silks (largely as a peasant industry), cottons (Shanghai and Hankow), iron and steel goods (at Hanyang and Hankow), pottery, paper, Indian ink and tobacco.

The principal town is *Hankow*, 600 miles from the sea, but nevertheless a port as it can be reached by ocean steamers. It is an important centre of commerce and transport, being connected by rail with Peiping in the north and almost with Canton in the south. *Shanghai* (see page 234), the great port of central and northern China, has an enormous entrepôt trade.

THE SOUTH-EASTERN PLATEAU lies between the basins of the Yangtse-kiang and the Si-kiang. Here tea, silk, cotton, sugar-cane and camphor are produced, and there is much undeveloped mineral wealth. North-south communication is difficult.

Hangchow, at the southern entrance of the *Grand Canal* which goes northwards right across the plain to the Hwang-ho and Tientsin, is connected by rail with Shanghai and Ningpo. *Amoy* and *Foochow* are important ports.

THE SI-KIANG VALLEY.—The Si-kiang rises in the plateau of Yunnan. The lower basin is densely populated, plentiful rainfall and abundant heat making possible the cultivation of large crops of maize, beans and wheat in the upland regions, and of rice and spices in the lower valleys. Cotton is cultivated in the dried parts, whilst sugar, tobacco, oilseeds and silk also are produced in Kwantung. Minerals are present but are little developed, the chief being coal, iron, copper, lead and zinc. Manufactures include silk, cotton and paper. The river is the principal means of transport.

Canton, the principal town and port, is situated on a tributary of the Si-kiang. It has good communications and is a manufacturing centre for textiles, lacquer-ware and matting.

THE YUNNAN PLATEAU is a fertile region with great mineral deposits, but owing to its unhealthy climate is largely undeveloped. Silk, rice and tea are the chief products, with maize and wheat of lesser importance. Opium was formerly a staple crop but has now declined. Tin is the only mineral worked at all extensively, but coal, gold, antimony, copper, iron and other minerals are present.

Foreign Trade and Foreign Possessions in China

TRADE.—The principal *exports* of China are raw silk, textile products, tea, wood oils, metals and minerals, including coal, hides, skins and raw cotton. The principal *imports* are cotton manufactures, metals and minerals, chemicals, machinery, dyes, tobacco, wool and woollen goods, coal and fish.

A large part of the trade is with Japan, followed by the United States, Britain and France.

The Foreign Possessions in China are *Hong Kong* (British, see page 234); *Kwang-chow Bay* and the two islands commanding the entrance to the bay (French); *Macao,* a port south of Hong-Kong, to which it has lost nearly all its trade (Portuguese); and the *Kwang-tung Peninsula,* or *Liao-tung Peninsula,* in the north, including the ports of *Dairen* (or *Dalny*) and *Port Arthur* (Japanese).

Sinkiang

Sinkiang, situated west of China and north of Tibet, is an unimportant plateau region covered by lofty mountains, with relatively low land in the *Tarim Depression* and *Dzungaria.* The former region is arid, so that the cultivation of wheat, barley, rice, fruit and cotton is confined to the irrigated river banks. Stock-rearing also is practised. Dzungaria, between the Altai and Tien Shan, has good pasture land in parts.

Mongolia

Mongolia is enclosed by Siberia in the north, Sinkiang in the west, China in the south and Manchuria in the east. It is composed of a high plateau with a general elevation of over 6,000 ft., rising in the west to still higher parallel mountain ranges, *e.g.,* the *Altai Mountains,* the *Tannu-ola,* the *Khangai* and the *Sayan.* The climate is one of extremes due to the great distance from the sea. There is much desert land (Gobi desert), but in places the rainfall is sufficient to support cattle and horse rearing by nomadic tribes.

Tibet

Tibet lies to the north of the Himalayas. It has an average elevation of 12,000 ft., and is dotted with numerous lakes. The climate generally is bleak and extreme. Pastoral agriculture is the chief occupation, the characteristic animal being the yak, though the hardier cereals, fruit and vegetables are grown in sheltered areas. The mineral wealth is considerable, but only gold and salt are worked.

The chief town, *Lhasa* (the "Holy" or "Forbidden" City), has gained fame largely through its inaccessibility.

MANCHURIA

Area : 363,700 sq. miles. *Population :* 24,000,000.

Manchuria, lying east of Mongolia and south of south-eastern Siberia, has recently become an independent State sponsored by Japan. Its official name is Manchukuo and its capital is Hsinking (formerly known as Changchun). It is built up of two mountain ranges running north and south—the *Khingan Mountains* in the west and a continuation of the Corean Highlands in the south-east, with a wide stretch of lowland between. In the north the plain is drained by the River Sungari, a tributary of the Amur, whilst in the south the River Liao flows into the Gulf of Liao-tung. The rainfall is affected by the monsoons, but the country has extremes of temperature. The plains are similar in relief and climate to the Canadian prairies and they will undoubtedly become of increasing importance for the production of cereals.

The principal products are millet, wheat, rice, soya beans and timber, while some coal is found near *Mukden*, the old capital, in the south of the Liao Valley. Other minerals, at present not fully developed, are iron and gold. There are numerous livestock and the production of beet and flax is developing.

The Liao-tung or Kwang-tung Peninsula (now Japanese) provides good ice-free harbours, of which *Port Arthur* is the most important, while the port of Vladivostok (U.S.S.R.) on the Sea of Japan at the end of the Trans-Siberian Railway, is largely used as an outlet for the products of both Manchuria and Siberia.

THE JAPANESE EMPIRE

Area : 260,644 sq. miles. *Population :* 92,000,000.

The Japanese Empire comprises a string of islands, over 1,600 in number, situated off the east coast of the mainland of Asia, and stretching through 30° of latitude from about lat. 50°N. to nearly 20°N.

THE EMPIRE includes the five main islands of *Honshiu* (the mainland), *Kiushiu*, *Shikoku*, *Hokkaido* (or Yezo) and *Formosa* (or Taiwan); together with the *Kuriles*, *Sado*, *Oki*, *Awaji*, *Iki*, *Tsushima*, *Luchu Islands* (*Riukiu*), *Bonin Islands* and *Pescadores Islands ;* the southern part of the island of *Sakhalin* (*Karafuto*) ; the peninsula of *Corea* (*Chosen*) on the mainland ; the *Liao-tung* (or *Kwantung*) *Peninsula*, also on the mainland ; and the *Ladrone*, *Caroline* and *Marshall Islands* in the Pacific.

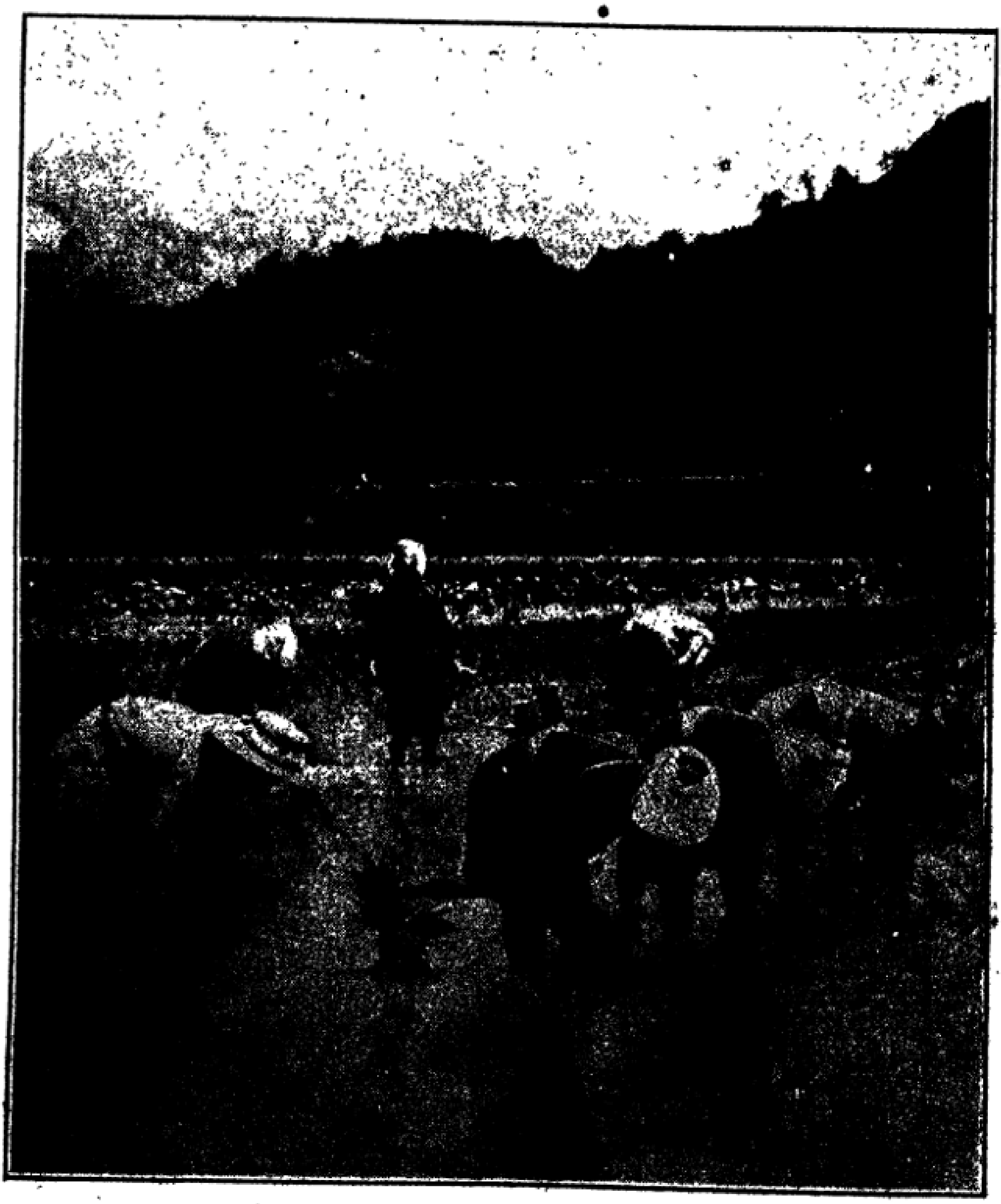
JAPAN PROPER, *i.e.*, excluding Corea, Formosa, Pescadores, Sakhalin and the Pacific Islands, has an area of 147,592 sq. miles and a population of 67,200,000.

Relief and Climate

The Japanese islands are very mountainous and consist in the main of an indeterminate mass of elevated land in which it is possible to distinguish two main chains running north-east to south-west. Between the mountains are small plains, the largest and most important being the plain of Tokyo. The *Inland Sea*, between Shikoku and the mainland in the south-west, is a drowned rift valley between the two mountain ridges. The islands as a whole are situated along a line of weakness in the earth's crust and are subject to much volcanic activity, serious earthquakes being a fairly frequent occurrence. The highest volcanic cone is that of Fujiyama, over 12,000 ft. above sea-level.

The Japanese rivers are short and of little use for navigation, but, as in the case of the United Kingdom, the indented coasts provide many good harbours, which have caused the Japanese to be a race of seamen, with large mercantile and naval fleets.

The climate, generally speaking, is monsoonal, but is not typically so owing to high latitude and sea influences. The widely differing latitudes of the various islands and the nature of the relief necessarily



[*Photo by W. F. Taylor.*

In Japan, Rice Cultivation is Vital Work.

Transplanting rice shoots in the swampy ground on a farm near Kyoto, Japan.

cause marked variations in temperature. The eastern shores are washed by the warm Kuro Siwo current, but the high mountains—running from north to south as a backbone along the islands—prevent the effects of winds blowing off this current from reaching the west, which, in winter, is open to cold winds from the mainland. The consequence is that there is a marked difference between the climates of the east and west coasts, the climate of the west being on the whole more extreme and less humid than that of the east. The west coast is warmer in winter than it would otherwise be owing to the presence of a west branch of the Kuro Siwo flowing through the Sea of Japan as far as La Perouse Strait. The north-east shores, however, are washed by the cold Kurile current, which meets the Kuro Siwo off Tokio and causes fogs (*cf.* Newfoundland). Rain falls throughout the year, but is heaviest in summer when the South-East Monsoon winds blow from over the Pacific, while in winter the cold north winds from Asia bring some snow.

Industries

The mountainous nature of the surface naturally makes much of the area of Japan unproductive and only one-fifth of the land is available for cultivation. The soil, however, is fertile, particularly in the volcanic

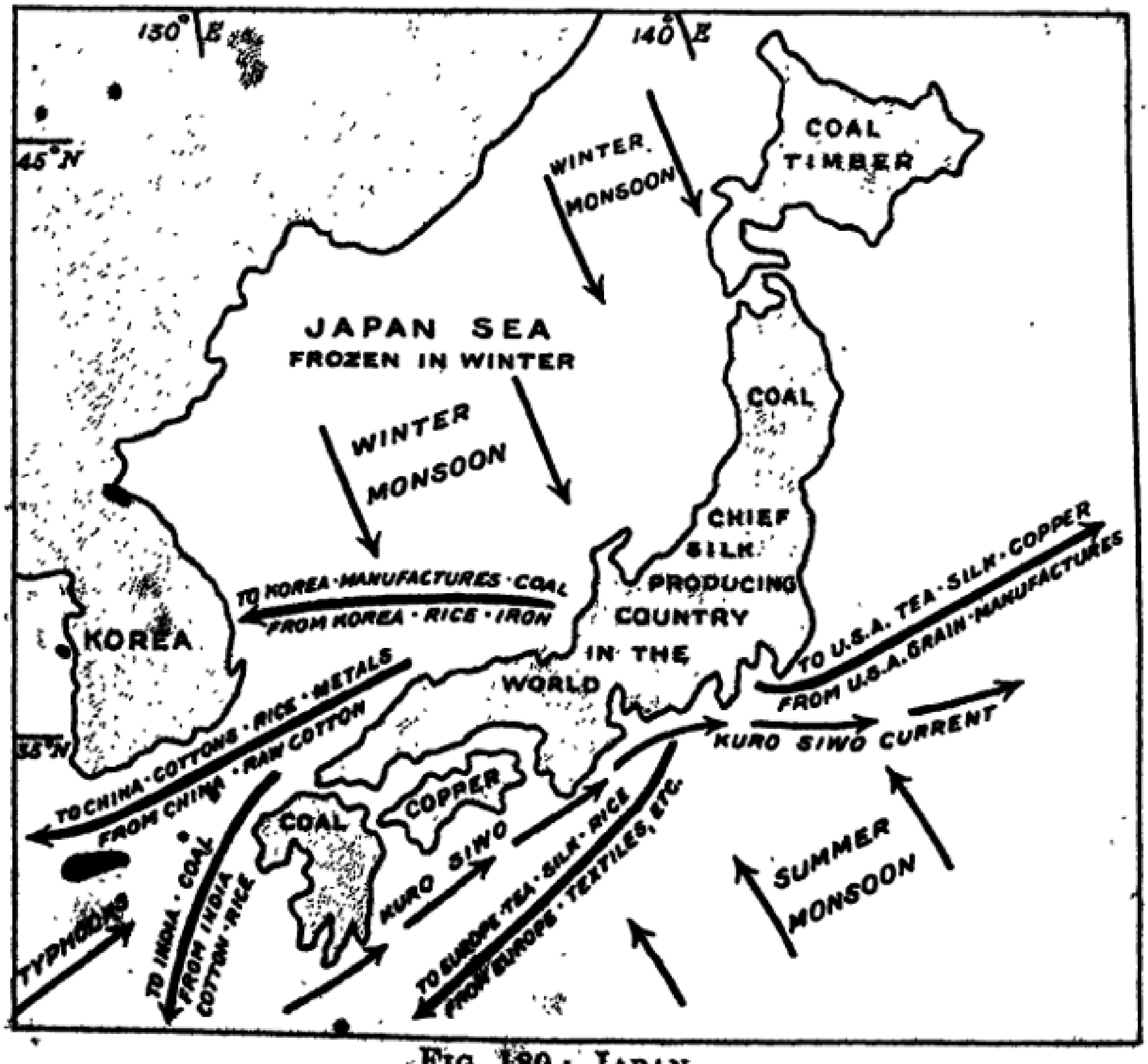


FIG. 180: JAPAN.

areas. The inadequate supplies of food and raw materials caused Japan to acquire Corea and Formosa, whilst more recently, she has assisted Manchuria to become an independent State and exercises a virtual protectorate over that country.

Forestry. About two-thirds of the total land surface of Japan is covered with forests. The forests of the north and on the higher lands of warmer areas produce lacquer, wax, bamboo and camphor. Those of the sub-tropical south produce sago-palm, oak, beech, pine and cedar.

Agriculture is carried on by intensive methods, but although all the available land is under cultivation (even steep hills cut into terraces being brought into use), food has to be imported to meet the needs of the dense population. Rice, the chief crop and staple food, is grown everywhere on the terraced hillsides, but mainly in the warmer south. Despite the large production, Japan is the world's leading importer of rice. Millet and barley are grown on the poorer soils of the rice areas, whilst wheat, barley and rye take the place of rice in the cooler north. Tea and silk, the leading export crops, are produced mainly in the warmer south. Other products include tobacco, cotton, sugar-cane, beans and peas. *Pasture* land is not of great extent.

Fishing.—The Japanese *fisheries*, which lie principally off Sakhalin, are important not only as a source of food, but also as a source of fish refuse which, in the absence of farm manure (Japan has few cattle), is used to fertilise the soil. The fisheries yield large quantities of sardines, herrings, bonitos, cod and salmon, as well as other fish.

Mining. Japan's minerals include sulphur, coal from Nagasaki (Kiushiu) and Hakodate (Hokkaido), iron (Honshiu), antimony, petroleum (Honshiu), copper (Honshiu and Shikoku), lead and silver.

Manufactures. The coal is insufficient for manufacturing purposes, and water-power is extensively used, while considerable quantities of iron-ore are imported from the United States and China, and there are large imports of raw cotton from the United States and India, and of wool from Australia. Japan is now a rival of Great Britain in the manufacture and export of cotton goods, the chief manufacturing centre being Osaka. Silk manufacture is very important, with Yokohama as the leading market and export centre. Other textile industries are woollen and rayon goods, whilst manufactures of iron and steel goods, shipbuilding, paper, matches, toys, fancy goods, glass, soap, chemicals and leather are all firmly established in this markedly progressive country.

Communications, Towns and Commerce

The chief towns of Japan are situated on the plain areas. *Tokyo*, the capital, and a manufacturing centre, is situated on the Bay of Tokyo in the east of Honshiu. Its port, *Yokohama*, is Japan's leading port and is an important manufacturing centre. *Nagasaki*, on the west of Kiushiu, has a good harbour. It is an important coaling port and calling place for steamers. *Osaka* is the "Manchester of the Orient," and with *Kobe*, its port, and the second port of the country, is the most important textile centre in Japan. These two towns are situated on the plain lying at the narrowest part of Honshiu, and at the eastern end of the Inland Sea. *Hakodate* is the chief port of Hokkaido and is connected by rail to all parts of the island.

Railways—running mainly along the lower coastal plain—connect the chief towns, but the only district where rail development has had much opportunity for progress is the wide plain of Tokyo.

Raw silk and manufactures of cotton and silk constitute 50 per cent. of the total *exports*. The chief *imports* are raw cotton and wool, wrought iron, machinery, oil-cake, wood, peas, beans, wheat, coal and petroleum.

About 35 per cent. of Japan's trade is with the United States, whilst India, China, Australia, the East Indies and Great Britain have a considerable share.

Formosa and Corea

FORMOSA (or Taiwan) is a Japanese island situated on the Tropic of Cancer. It has an area of 13,890 sq. miles and a population of over 4,600,000. The centre and east are mountainous, and the west flat. The climate is oceanic and rather warm, with rainfall mostly in the summer. Camphor, the chief product, is almost a world monopoly. Other crops are rice, sugar-cane, ginger, tea, ground nuts and fruits, while iron, mercury, coal and gold are present but are not greatly developed.

The chief town is *Taihoku* in the west, with *Keelung*, in the north, and *Takau*, in the south-west, the chief ports. A railway, linking up these three towns, traverses the western plain. Another railway runs along the central part of the east coast from *Pinan* in the south to *Karenko*.

The principal *exports* of Formosa are tea, sugar, camphor, rice, alcohol and coal. The *imports* are fertilisers, soya beans, liquid fuel and gunny bags.

The trade is mainly with Japan.

COREA (Chosen) is a peninsula on the mainland opposite southern Japan, with an area of 85,228 sq. miles and a population of over 21,000,000. Mountains run along the east coast, but the west is somewhat lower. Extremes of temperature are experienced, and rain, brought by the South-East Monsoon, falls largely in the summer months. The country is being rapidly developed by the Japanese. Rice is the main crop, while cereals, beans, tobacco, fruit and cotton also are cultivated. Silk worms are reared and whaling is carried on.

Corea has extensive deposits of gold, coal, iron and copper, all of which are urgently needed by the Japanese and which will be freely exploited as communications are improved.

Seoul, in the Kan Valley on the west coast, is the capital, and *Fusan*, in the south-east, is the chief port. Fusan is connected by rail to

Mukden *via* Seoul, whence a branch line runs to Gensan, in the east. A further branch from Mokpo in the south-west joins the main line at Taiden. Rice is easily the most important *export* from Corea. The *imports* include cotton goods, fertilisers, machinery, oil, silk goods, coal, paper and sugar.

The bulk of the trade is with Japan.

INDO-CHINA

Indo-China is a peninsula lying to the south of China and east of Burma and comprises the kingdom of *Siam* in the west and *French Indo-China* in the east.

Siam (*area:* 200,234 sq. miles; *population:* 11,700,000) consists mainly of the valley of the *Menam*, with a mountainous western border in the Malay Peninsula and a low eastern border, mainly along the great river Mekong, which, for a large part of its course, separates Siam from French Indo-China.

The climate is of the monsoon type, and the chief products and exports are rice (60 per cent. of the total exports), tin (10 per cent.) and teak (5 per cent.). Chinese immigrants have done much to develop the country, and this, together with more extensive irrigation and further improvement in communications, should bring increased prosperity. Cotton goods, foodstuffs and metal goods are the leading imports.

Bangkok, at the head of the Gulf of Siam, is the capital and port. It has a poor harbour, but has rail connection with Singapore at the southern end of the Malay Peninsula and with Chieng-mai, in northern Siam. It is also a station on the Imperial air route to the east.

French Indo-China (*area:* 285,000 sq. miles; *population:* 22,000,000) is typically monsoonal in the south. The central highlands have rain at all seasons, but the extreme south has a very dry winter.

There are three divisions: (1) *Cambodia* and the lower *Mekong* valley (the latter including Cochin China, southern Laos and part of southern Annam) in the south, which is one of the world's chief rice exporting regions, the chief town being *Saigon*, the capital of Cochin China; (2) *Central Annam*, a plateau region, with *Tourane* as its port, which exports cinnamon, tea, silk and sugar; and (3) *Tongking* and *Northern Annam* (chief town *Hanoi*, the capital of French Indo-China), both of which send teak down the river to the coast for export, and which carry on agriculture, mining (chiefly for coal) and some manufacture (cotton, paper and tobacco).

MALAY STATES

Area: 51,000 sq. miles. *Population:* about 4,000,000.

The Malay States constitute the important long and narrow Malay Peninsula of south-eastern Asia, bounded on the north by Siam, on the east by the South China Sea, on the west by the Bay of Bengal, and on the south by the Straits of Malacca, across which is the great island of Sumatra.

Politically the peninsula is divided into three parts as follows :—

THE STRAITS SETTLEMENTS, comprising *Singapore*, *Penang*, *Malacca* and *Province Wellesley*. This area is British territory and contains the important ports of Singapore, Penang and Malacca.

Connected politically with the Settlements are the dependencies of the *Cocos* (or *Keeling*) *Islands*, lying about 1,200 miles south-west of Singapore ; *Christmas Island*, lying south of Java ; and *Labuan*, a small island lying 6 miles off the coast of British North Borneo.

THE FEDERATED MALAY STATES—*Perak*, *Selangor*, *Negri Sembilan* and *Pahang*—are governed by independent native princes with advice from British High Commissioners. This region is the most important tin producing area of the world. The ore is mainly sent to Singapore for smelting. The chief towns of this district are *Kuala Lumpur* and *Port Swettenham*. The *Dindings*, a track of territory of about 200 sq. miles which was formerly attached to Penang, was returned to Perak in 1934.

THE UNFEDERATED MALAY STATES, comprising *Johore*, *Kedah*, *Kelantan*, *Perlis* and *Trengganu*, are governed by native princes with unofficial British advice.

Along the centre of the Malay Peninsula is a mountainous range 6,000 ft. high. As the region is in the tropics there is much rain and, as the sun is directly overhead twice yearly, the temperature is always high. Such a climate produces luxuriant forest growth, with jungle on the coasts. Rubber, bamboo, timber, canes, gums, copra, sago, tapioca, spices, rice and palm-oil are produced.

The most important exports are rubber (about *one-half of the world's supply*), tin (about *one-third of the world's production*) and pineapples. Some gold also is mined.

The principal towns and ports are the British centres : *Singapore* (see page 233), *Penang*, an important port, with a large entrepôt trade, on an island off the north-west coast, and *Malacca*, in the south-west.

Communications are well-developed in the west, which is the most productive area. There is an excellent system of roads, particularly in the rubber and tin areas, whilst a railway runs the whole length of the peninsula from Singapore, northwards to connect with the Siamese railw[illegible], and there is a branch inland from the south-west. In addition, Malaya is served by the Imperial air route, which runs from Bangkok *via* Penang to Singapore.

The CHRISTMAS ISLANDS produce phosphates ; the COCOS ISLANDS export copra, while LABUAN has valuable coal deposits.

THE MALAY ARCHIPELAGO

Philippine Islands

The Philippines form part of the festoon of islands of eastern Asia. They belong to the United States and consist of 7,083 islands with a total area of 114,400 sq. miles, and a total population of over 13,000,000. The islands are mountainous and volcanic, earthquakes and typhoons being of frequent occurrence. Though originally covered with tropical forest, much of the land has now been cleared, and development under white supervision, mainly American, has resulted in considerable production. The climate is tropical, tempered by sea influences. The principal islands are Luzon, Panay, Cebu and Mindanao.

LUZON, on which stands *Manila*, the capital, principal port and commercial centre of the Philippines, exports hemp, sugar, tobacco, cigars, coffee, indigo and copra.

PANAY contains the port of *Iloilo*. Its chief export is sugar, followed by rice, tobacco and hemp.

CEBU, with the port of *Cebu*, exports hemp, sugar and copra.

MINDANAO, containing the port of *Zamboanga*, exports copra, timber and hemp.

The East Indies

The East Indian Islands belong for the most part to the Netherlands, and include *Sumatra*, *Java*, *Borneo*, *Celebes*, *the Moluccas* (or *Spice Islands*), *Timor* and numerous other islands stretching in a chain south of the Malay States and the Philippines. The Dutch Islands are known collectively as the *Netherlands East Indies*. *Northern Borneo* belongs to Britain and the *east of Timor* to *Portugal*.

THE NETHERLANDS EAST INDIES are volcanic, mountainous islands subject to earthquakes, and, as they lie on or near the Equator, they experience abundant heat and moisture. The total area is 733,300 sq. miles, with a population of about 60,000,000, of which 42,000,000 are concentrated in Java and Madura, where the density of population is 818 persons to the square mile.

Java is easily the most important of the islands and is a remarkable example of the harnessing of tropical productivity by the white man (Dutch). The fertile volcanic soil combined with the heat and moisture make crop-raising easy, rice being the main crop and the staple food. Crops introduced by the white settlers also thrive, and of these, maize, sugar, tea, rubber, sisal, cinchona, oil palm products and coffee are of great importance.

Sourabaya, in the north-east, is the largest town, and *Batavia*, in the north-west, is the principal port, exporting all the above-named commodities, together with manufactures and fertilisers.

Sumatra is noted for its tobacco crop and produces also rubber, copra, coffee and spices. *Palembang,* in the south-east, and *Padang,* in the centre of the narrow western coastal plain, are the principal towns. The small island of BANKA is rich in tin, while BILLITON produces iron and timber.

Dutch Borneo produces copra, rubber and petroleum; THE MOLUCCAS spices, and THE CELEBES coffee, copra and spices.

The capitals are also the chief ports, *viz., Banjermassin* in Dutch Borneo, *Macassar* in the Celebes, and *Amboyna* in the Moluccas.

BRITISH BORNEO consists of British North Borneo, Brunei and Sarawak. British North Borneo and Brunei produce rubber, gutta percha, gums, camphor, rattan canes, tobacco, and edible birds' nests. Sarawak produces similar commodities, but pepper and sago are more important. Coal is found in all these territories, while petroleum (the most important mineral) and gold are worked in Sarawak.

The foreign trade is centred at *Sandakan* (the capital) and *Jesselton* in British North Borneo; at *Kuching* (the capital) in Sarawak; and at *Brunei* (the capital) in Brunei.

QUESTIONS ON CHAPTER 26

1. (*a*) What minerals are to be found in India ?
   (*b*) Where are they to be sought ? (*L.A.A. Prelim., June,* 1930)
2. There are 320,000,000 people in India. Analyse the factors which determine the irregular distribution of this vast population. (*I. of B., Pt. I,* 1931)
3. Draw a sketch-map of India giving as far as possible the boundaries and names of the chief Native States. (*S.A.A. Prelim., Nov.,* 1931)
4. What and where are Aden, Cyprus and Hong-kong, and what are the circumstances giving importance to them ? (*I. of B., Pt. I,* 1929)
5. What do you understand by a "Monsoon type" of climate ? Give an account of the seasons in the Ganges plain and explain how the Monsoon affects the life of India. (*C.I.S. Prelim., Dec.,* 1931)
6. Give a short account of (*a*) the physical features, (*b*) vegetable products, (*c*) mineral products of Ceylon. (*L.A.A. Prelim., Dec.,* 1930)
7. Write down in their order of importance the six chief towns of India, and state to what causes the importance of each is due. (*L.A.A. Prelim., Dec.,* 1929)
8. Compare and contrast the Indus and Ganges basins. (*I. of B., Qual.,* 1930)
9. What are the natural hindrances to communication in the peninsular portion of India ? (*I. of B., Pt. I,* 1929)
10. What are the chief agricultural products of India ? Mention the chief regions of production. (*I.C.W.A. Prelim., Dec.,* 1930)
11. Compare England and Japan with regard to the following :—
    (*a*) Area, (*b*) Population, (*c*) Relief, (*d*) Agricultural and (*e*) Mineral Resources. (*I.C.W.A. Prelim., Dec.,* 1930)
12. On a map of India show the position of Assam, Baluchistan, and the Thar Desert, and name the Jumna and the Irawadi. Write the words "tea" and "wheat" each over *one* region in which the plant is extensively grown, and shade in black an area of dense population. Mark and name Bombay, Karachi and Rangoon, and under each write the names of *two* important exports. (*C.S., Jan.,* 1931)

CHAPTER 27

AFRICA

AFRICA is the second largest of the continents and is almost bisected by the Equator. The most northerly point, Cape Blanco in Tunisia, lies in lat. 36° N., whilst the most southerly point, Cape Agulhas in Cape Colony, lies in lat. 35° S. The total length is about 5,000 miles, and the greatest width (from Cape Verde in Senegal to Cape Guardafui in Italian Somaliland) is about 4,600 miles. The continent has an area of 11½ million sq. miles and an estimated population of 143,000,000. The Mediterranean Sea forms the northern boundary, the Atlantic Ocean the western boundary, and the Red Sea and the Indian Ocean the eastern boundary.

The narrow neck of land known as the Isthmus of Suez joins Africa to Asia, and although the Suez Canal now separates the two continents, Africa may be considered as a huge peninsula of the Eurasian land mass.

With the exception of LIBERIA in the west, ABYSSINIA in the east and EGYPT in the north-east, which are independent States, the whole of Africa is under the suzerainty, directly or indirectly, of European countries. The greater part is under British and French control but Portugal, Italy, Belgium and Spain also exercise dominion over extensive areas.

The British territories include:—

1. The ANGLO-EGYPTIAN SUDAN and BRITISH SOMALILAND in the north-east;
2. BRITISH EAST AFRICA, which includes *Tanganyika* (Mandate), *Kenya* and *Uganda*, together with the islands of *Zanzibar*, *Pemba* and certain adjacent islands in the east;
3. NORTH and SOUTH RHODESIA and NYASALAND, south of Tanganyika;
4. THE UNION OF SOUTH AFRICA, which includes the *Cape of Good Hope Province*, *Natal*, the *Transvaal* and the *Orange Free State*, together with the territories of *Basutoland*, *Bechuanaland* and *Swaziland*, and the mandated territory of *South-West Africa*; and
5. BRITISH WEST AFRICA, which comprises *Nigeria*, the *Gold Coast*, *Sierra Leone* and *Gambia*.

Relief

The whole continent of Africa consists of an enormous worn-down plateau with the greatest elevation south of the Equator, the only true mountain systems being the *Atlas* region of the extreme north-west (Great Atlas, Maritime Atlas and Saharan Atlas), which is geologically part of Europe, and the *Abyssinian Mountains* near the Red Sea on the east. To the south of the Atlas, in the middle of the Sahara, are the *War Mountains* and *Tibesti Highlands.*

In South Africa the land rises from a narrow coastal plain in steps known as the *Little Karroo* and *Great Karroo* to the plateau or *High Veld*, which has an undulating surface covered with flat-topped hills known as "kopjes." In the east of South Africa along the coast lie the *Drakensberg Mountains*, which form part of the edge or escarpment of the plateau, and which rise to over 11,000 feet above sea-level in Natal.

The only considerable low-lying areas in the continent are those around the coasts, especially where the great rivers have laid alluvial deposits, *e.g.*, the valley of the Nile on the Mediterranean coast in the north-east; the valley of the Senegal and Gambia on the North Atlantic coast in the west; the valley of the Niger opening out into the Gulf of Guinea; the Sabi-Zambesi plain opposite Mozambique; and the plains of the Juba and the Webbe Shibeli in Italian Somaliland on the east. The narrow coastal plain makes the coastline moderately even everywhere, and throughout the continent there is a remarkable lack of good, natural harbours.

In addition to the islands of *Zanzibar* and *Pemba* already mentioned, there are numerous others. Off the north-west coast are *Madeira* (Portuguese), the *Canaries* (Spanish), and the *Cape Verde Islands* (Portuguese); and off the south-east coast, the large island of *Madagascar* (French).

North-west Africa is separated from Spain only by the narrow *Straits of Gibraltar.* In the bend of the west coast is the vast *Gulf of Guinea,* the northern coastline of which is known in different parts from west to east as the *Grain Coast,* the *Ivory Coast,* the *Gold Coast* and the *Slave Coast.* This great Gulf also includes the *Bight of Benin* and the *Bight of Biafra,* in the latter of which are situated the small islands of *Fernando Po* (Spanish), *Principe* (Portuguese), *São Thomé* (Portuguese), and *Annobon* (Spanish). On the east, the *Mozambique Channel* lies between Madagascar and the mainland, with the *Azanian Sea* to the north.

African Lakes and Rivers

The great lakes of Africa lie either in rift valleys or in hollows in the surface of the land. The rift valley lakes lie mainly in the east where they form two long strings, running north and south along long. 30° E. and 35° E. approximately, following the edges of the higher part of the plateau. Examples of these rift-valley lakes are Lakes *Rudolf*, *Albert Edward*, *Tanganyika* and *Nyasa*. *Victoria Nyanza* (the largest African lake), in the centre of the plateau between the two strings of rift-valley lakes, *Lake Tsana* (Abyssinia) and *Lake Chad* (north of Nigeria) represent the other variety of lake formed in surface hollows, as also do the shallow, brackish "shotts" (salt lakes) of the *Shott Plateau* in the Atlas region.

Great rivers run in all directions from the heights of the plateau to the coast, but in every case navigation is impeded by the steep fall from the plateau to the plains, as instanced by the several cataracts of the Nile, the vast Livingstone Falls of the Congo and the magnificent Victoria Falls of the Zambesi.

The NILE is one of the longest rivers in the world (4,000 miles) as well as one of the most renowned from both an historical and a tourist point of view. Its head stream, the *Kagera*, flows into Lake Victoria, and passes northward as the *Victoria Nile* over the Ripon and Murchison falls, to Lake Albert. From here it emerges as the Nile proper and flows almost due north, receiving the *Sobat* from the east and the *Bahr el Ghazal*, the only important left-bank tributary, from the west, a little south of lat. 10° N. After a short course eastward the river continues north as the *White Nile* to Khartoum, where it is joined by the *Blue Nile*, which rises in *Lake Tsana*. The course of the river up to Khartoum is impeded by a mass of floating vegetation known as "sudd."

Continuing from Khartoum northward, the Nile receives the *Atbara* (from Abyssinia) a few miles south of Berber, and then follows a generally northward course of nearly 1,500 miles to the Mediterranean Sea, during which it receives no tributaries and is impeded by six cataracts between Khartoum and Aswan. This latter part of its course lies in a narrow valley surrounded by desert and opens out into a huge delta, the apex of which is 85 miles from the sea.

The annual floods of the Nile, due to the summer monsoon rains of Abyssinia, supply abundant water for irrigation purposes and on their retreat from the flooded areas leave behind a rich deposit of fertile alluvium. The Nile is navigable from its mouth for a distance of 800 miles to the first cataract by ordinary vessels, and above the cataracts by specially built vessels.

The CONGO has a greater volume than any other African river because its vast basin lies almost entirely in the equatorial region of heavy rainfall. It is 3,000 miles long and rises in the Muchinga Mountains of Northern Rhodesia in the middle of the great central plateau. As it flows northwards it drains Lakes Bangweolo and Mweru, and receives the overflow of Lake Tanganyika on its right bank. Shortly after crossing the Equator the river leaves the plateau by Stanley Falls, and having turned west, and then south-west, it recrosses the Equator and descends the great Livingstone Falls below Stanley Pool on its way to the Atlantic. The river is navigable between Stanley Pool and Stanley Falls, and receives its principal tributary, the *Kasai*, on its left bank some distance before it reaches the Pool.

The NIGER, the SENEGAL and the GAMBIA all rise in French Guinea near the coast, but whilst the Senegal and the Gambia flow to the west in roughly parallel courses, the Niger flows first north-east and then south-east, making a great curve. The latter part of its course is through Nigeria, where it receives its most important tributary, the *Benue*, which has its source in the highlands south of Lake Chad. The Niger flows into the Gulf of Guinea through a large swampy delta.

The ZAMBESI rises in the same region as the Congo, flowing south until joined by the *Kuando*, when it turns east, rushes over the famous Victoria Falls, and bends north-eastward, east and south-east to reach the Indian Ocean through a delta which is not easily navigated.

The LIMPOPO rises in the High Veld near Pretoria, and after describing a semi-circle reaches the Indian Ocean in Delagoa Bay.

The ORANGE rises in the Drakensberg and flows westward to the Atlantic, the chief tributary being the *Vaal*. It is not of great importance as the lower reaches are almost dried up in dry seasons, and on occasion they are quite waterless.

Climate of Africa

The main factors influencing the climate of Africa are (1) the high altitude of the sun as a result of low latitude; (2) the influence of relief on (*a*) temperature (particularly in the south, where the normal increase in temperature towards the Equator is offset by the increasing height of the land in the same direction), and (*b*) on rainfall (more especially in the south-east); (3) the influence of ocean currents—in the west,

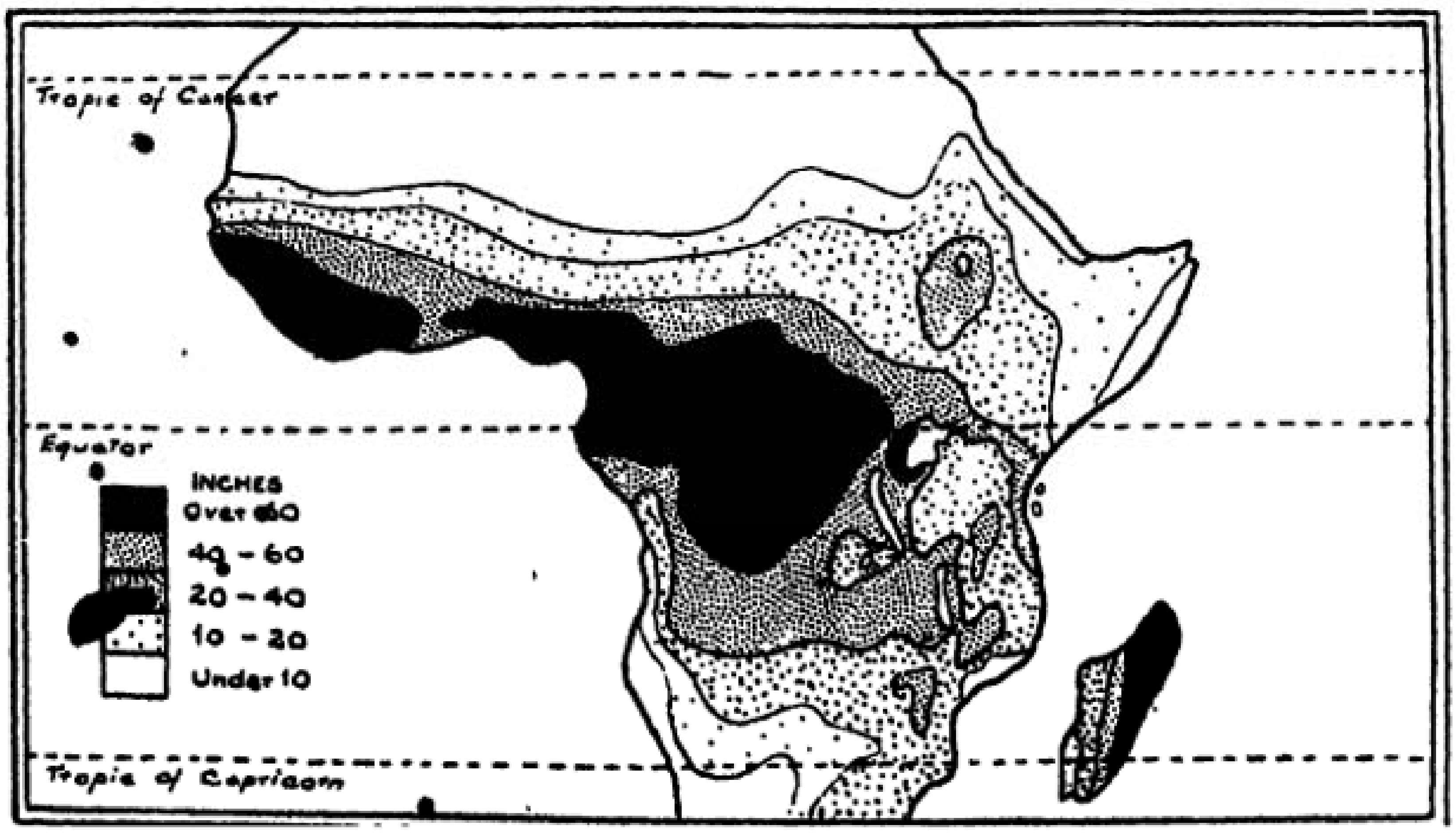


FIG. 181: MEAN ANNUAL RAINFALL OF TROPICAL AFRICA.

the cool Benguela and Canaries Currents and the warm Guinea Current, in the east, the warm Mozambique Current.

The climatic seasons in Africa are determined mainly by the amount of rainfall. Central Africa is naturally very hot owing to its equatorial situation, which causes it to be under the almost vertical sun throughout the year. In this equatorial area convectional rain is very heavy, and regions such as the Cameroons and the Congo basin receive as much as 80 inches per annum. Most of the rain falls in two seasons, following the periods of greatest heat, though there is no deficiency at any season.

In the northern summer, the belt of greatest heat moves north and summer rains are experienced in Northern Nigeria, the Sudan and Abyssinia; whilst in January the heat equator moves south and such areas as Angola, Northern Rhodesia and Mozambique have their heaviest rainfall. North and west of the Sudan is a vast area under the influence of the North-East Trade winds which, blowing to warmer latitudes and being dry at the outset by reason of their course overland across Asia, deposit no moisture. This area, comprising the vast Sahara Desert, is therefore one of great aridity. On the other side of the Equator in the south-west is the *Kalahari Desert* which is dry because in winter it is a region of high pressure, whilst in summer the S.E. Trades lose all their moisture on rising over the Drakensberg Mountains and the eastern part of the plateau.

North-west of the Sahara in the Atlas region is an area which has a dry season in summer when it comes under the influence of the North-East Trades and a wet season in winter when the Westerlies move south with the sun and bring rain from the North Atlantic. This area comprises the Mediterranean coastlands, *viz.*, the northern coasts of Morocco and Algeria and the peninsula of Barka. South of the Equator there is a corresponding, though small, Mediterranean climatic region around Cape Town. This has a hot summer with little rain (as the South-East Trade winds are weak and blow mainly parallel to the coast), and a mild wet winter when the Westerlies bring rain from the South Atlantic.

Natural Regions of Africa

The broad natural regions of Africa correspond mainly with the climatic regions, but there are certain modifications due to local variations in relief. The regions include (1) the Equatorial Region; (2) the East Coast Region; (3) the Savannah; (4) the Desert Regions; (5) the Nile Valley; (6) the Mediterranean Regions; (7) Abyssinia; (8) the Horn of Africa; (9) the South-East Coast Region; (10) the Interior Plateau of South Africa, and (11) Madagascar.

The Equatorial Forest Region, with heavy rainfall and high temperatures throughout the year, embraces the Guinea coastlands and the basin of the Congo. The region is largely unexploited owing to the unfavourable conditions for permanent settlement. Along the waterways and the Guinea coast, however, there is some development and copra, palm-oil, rubber, cocoa, groundnuts and timber are valuable products.

The East Coast Region, comprising the coastal plains of Mozambique, Tanganyika and Kenya, has tropical forests, though these are of less density than those of the Congo basin. There is a summer rainfall maximum and the cultivated products are naturally of a tropical type.

The Savannah Region lies to the north and south of the Equatorial Region. The rainfall occurs chiefly in summer and the natural vegetation consists of tall grasses with scattered trees. Included in this region are the higher parts of the lands north of the Gulf of Guinea, most of the Sudan, the higher parts of British East Africa and most of Angola.

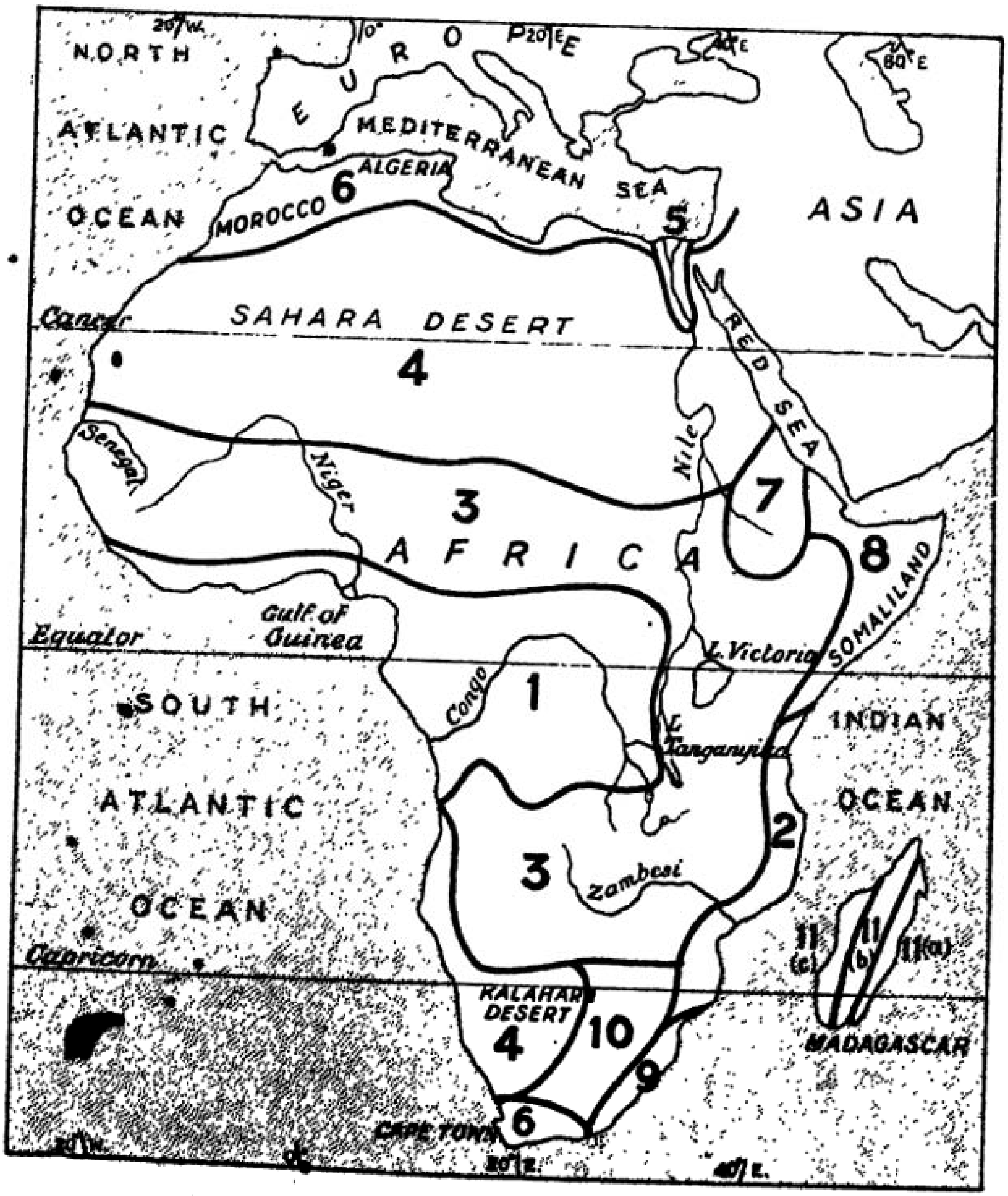


Fig. 181a. Natural Regions of Africa.

DESERT REGIONS occur north and south of the savannah lands. In the north, the *Sahara* stretches right across Africa in an unbroken expanse except in the valley of the Nile. In the south-west lies the *Kalahari* desert. (Refer to Chapter 9.)

THE NILE VALLEY, although strictly part of the northern desert area, is justly regarded as a separate region because of the cultivation made possible by the flood-waters of the river.

MEDITERRANEAN REGIONS are found in the extreme north along the southern shore of the Mediterranean Sea, and in the extreme south-west in Cape Colony. They have a typical Mediterranean vegetation and produce wine, fruits and cereals.

ABYSSINIA forms a separate region on account of its altitude. It has monsoon rainfall and varying temperatures. The products are of a tropical and sub-tropical nature, and vary with the height of the land. The highest parts produce cereals, while the lower slopes yield cotton and coffee.

THE HORN OF AFRICA, consisting of Somaliland, has a low rainfall because the South-East Trades (which in summer would otherwise blow onshore and bring rain) become deflected as they cross the Equator and so blow in a north-easterly direction parallel to the east coast and off the north coast. In winter, the prevailing winds are from the north-east and they, too, are consequently dry. The vegetation is semi-scrub, suitable only for pasture.

THE SOUTH-EAST COAST REGION is a sub-tropical or warm temperate area with summer rainfall (*see* page 16).

THE INTERIOR PLATEAU of South Africa is a grassland region (*see* page 19).

MADAGASCAR can be divided into three regions : (*a*) the east coast, which is exposed to the rain-bearing South-East Trades throughout the year and is heavily forested ; (*b*) the central plateau, with summer rain and extensive grasslands ; and (*c*) the west coast, with summer rain and higher temperatures than the plateau.

Communications of Africa

The great rivers of Africa are all navigable for long distances though not continuously, because of the numerous interruptions in the form of rapids and waterfalls. Except for the lower Nile the rivers are for this reason useless for ocean vessels. (Refer to pp. 518–519 and Chapter 19.)

Road and railway construction is extremely difficult, because of the vast expanses, in different parts, of uncivilised territory, of tropical jungle, of high mountain land and of arid desert. The Sahara, especially, proves a great barrier to transcontinental traffic owing to its shifting, sandy surface, which makes road and rail construction difficult. The desert is crossed by camel caravans which follow routes that utilise the various oases as bases, while recently the French have demonstrated that it is possible to cross this enormous expanse of country by suitably equipped motor-cars.

The famous Cape-to-Cairo Railway is still some hundreds of miles off completion, and the establishment of the Trans-African air route will further retard its progress, for the air route can fulfil efficiently the main purpose of the rail route, *viz.*, a speeding up of communication between Europe and South Africa. The northern section of the railway, commencing at Cairo, follows the Nile Valley to Aswan, between which place and Wadi Halfa there is a break. From Wadi Halfa the line continues to Berber, Khartoum and Makwar, the present railhead. The southern section of the railway runs from Cape Town through De Aar Junction to Kimberley and Mafeking, thence to Bulawayo in Southern Rhodesia, through Wankie, over the Zambesi at the Victoria Falls to Livingstone and Broken Hill in Northern Rhodesia, and thence into Belgian Congo to Elizabethville, Bukama, and Port Francqui (Ilebo), the present railhead.

The so-called Benguela-Beira Railway provides a rail route across Africa from west to east. It consists of a line from Beira in Portuguese East Africa (Mozambique) *via* Salisbury to Bulawayo, whence the Cape-Cairo line is utilised as far as Tenke in the Belgian Congo. From Tenke westwards, a line runs to Lobito Bay (near Benguela) in Angola (Portuguese West Africa). This line provides a shorter route to Europe from the centre of the continent and should do much to open up the mineral wealth of the Katanga district of the Congo.

In the Union of South Africa there is a large and very efficient network of lines joining the mining and agricultural centres to the ports. Elsewhere, except in the Mediterranean States of the north, the railways consist of short disconnected lines from the ports inland. There is a triangular route in Nigeria with Lagos and Port Harcourt as the two base ports and Kaduna as the apex, while Port Sudan on the Red Sea has two lines running to the Nile railway. The French are considering the construction of a Trans-Saharan railway.

Reference should here be made to Fig. 144 in Chapter 18 and to Chapter 19 for the air routes, which are of considerable importance.

THE UNION OF SOUTH AFRICA

Area : 472,347 sq. miles. *Population :* 8,400,000.

Relief

The Union is physically part of the South African Plateau and, as in the remainder of the continent, there are few good harbours owing to the marked regularity of the coastline and the sandbars at the river mouths. The four broad physical features are (1) the Coastal Plain ; (2) the Karroos and the Plateau slopes ; (3) the Escarpment, which marks the transition between the Karroos, and (4) the Interior Plateau or High Veld.

THE COASTAL PLAIN has an average elevation of 500 to 600 ft. and varies considerably in width and formation.

THE KARROOS. In the south, the coastal plain rises in "steps" to the escarpment. The slope to the first "step" is formed by the Langeberg and other ranges, to the north of which is the "step" itself, known as the *Little Karroo*, consisting of a stretch of flat, dry country varying from 15 to 20 miles wide and having an average elevation of 1,500 ft. To the north of the Little Karroo, the land rises to the Zwarteberg Range, between which and the edge of the plateau lies the *Great Karroo*. This is the second "step", consisting of a stretch of undulating plains 2,000 to 3,000 ft. above sea-level, about 100 miles wide and extending for about 400 miles from east to west.

On the east the coastal belt is much narrower than in the south, and the ascent to the plateau is more abrupt, taking the form of well-marked parallel terraces or steep slopes.

THE ESCARPMENT, or edge of the plateau, forms a curved line of mountains over 2,000 miles in length, highest in the east and south. In the east lie the lofty *Drakensberg Mountains*, in the south the *Stormberg, Sneeuwberg, Nieuwveld, Komsberg* and *Roggeveld* mountains, whilst in the west the chief range is the *Kamiesberg*.

THE HIGH VELD is composed of horizontal layers of rocks which, during the ages, have weathered down, leaving isolated flat-topped hills—the "kopjes." There are in addition some ranges of hills, of which the famous gold-bearing *Witwatersrand* in the Transvaal is the most important. The veld is highest in the east, so the Orange and Vaal rivers carry the main drainage to the Atlantic. In the north and north-west of the Transvaal the plateau slopes down to the valley of the Limpopo.

Climate of South Africa

With the exception of the north of the Transvaal, the whole of the Union lies within the warm temperate zone and, generally, the summers are hot and the winters mild. Owing to the elevation of the interior and to the fact that the general level tends to rise towards the north, *i.e.*, towards the Equator, thus counteracting the ordinary increase of temperature with decrease of latitude, the mean annual temperature of the different parts of the country is remarkably uniform. The plateau, however, experiences colder winters than the coastal areas, because the heat received by the land is rapidly lost by radiation, and thus a greater range of temperature results. Similarly, the daily range of temperature is much more marked on the plateau than on the coast. In the interior on the southern part of the plateau the temperature may fall below freezing point at night during any month of the year and, in winter, severe frosts are of fairly frequent occurrence; but on the coast such vagaries of climate are almost unknown. The west coast is washed by the cool Benguela Current and has a lower mean temperature than the east and south coasts, where the warm Mozambique Current flows along the shores. Off Cape Agulhas, where these currents meet, frequent fogs are experienced.

The distribution of rainfall in the Union has an important influence on the distribution of farming, whilst the irregularity of the rainfall gives rise to serious droughts.

The greatest amount of rainfall occurs in the summer months during the prevalence of the South-East Trade winds. After crossing the coastal belt, the winds are forced to rise over the eastern escarpment of the plateau, and as a result the coastal region and the windward slopes of the Drakensbergs receive abundant rainfall. Beyond the escarpment, however, the precipitation steadily diminishes, until at Port Nolloth, on the west coast, the mean annual rainfall is only 2 inches, and a considerable area in the north-west, having less than 10 inches of rainfall in the year, forms part of the Kalahari Desert. On the whole, the summers are wet and the winters dry, the great exception being the small "Mediterranean" region in the south-west, where converse conditions prevail.

Natural Regions of the Union

The natural regions of the Union are based mainly on climate, and include (1) the South-West of Cape Province; (2) the South of Cape Province; (3) the South-East Coast; (4) the Eastern Interior; (5) the Western Interior and the Karroos; (6) the North-West Coastal Area, and (7) the Low Veld.

The South-West of Cape Province has a Mediterranean type of climate and a typical Mediterranean vegetation. Grapes and other fruits are produced abundantly for home consumption and export, and there is an important and developing wine industry. Wheat, barley and tobacco also are cultivated.

The South of Cape Province, between the Great Karroo and the sea, is a coastal region with both winter and summer rain and a higher temperature than the south-west. The coast is forested with evergreen trees, but in the interior the vegetation changes to scrub and grassland. Maize and tobacco are the principal crops, while cattle and sheep are reared in large numbers on the low lying pastures.

The South-East Coast has summer rainfall and a uniformly high temperature. The coastal lowlands are covered with sub-tropical forests, in the clearings of which sugar-cane, rice, tea, maize, cotton, bananas and other fruits are cultivated. The higher interior lands produce temperate cereals, as well as dairy produce, cattle (and sheep also) being reared here in large numbers.

THE EASTERN INTERIOR, which includes the greater part of the Transvaal and the Orange Free State, lies nearly 5,000 ft. above sea-level. The rainfall occurs in the hot summer, the winters being cool and dry, with frost. This is a grassland region where wheat, maize, tobacco and cotton are produced, and where numerous cattle, sheep and ostriches (for feathers) are reared.

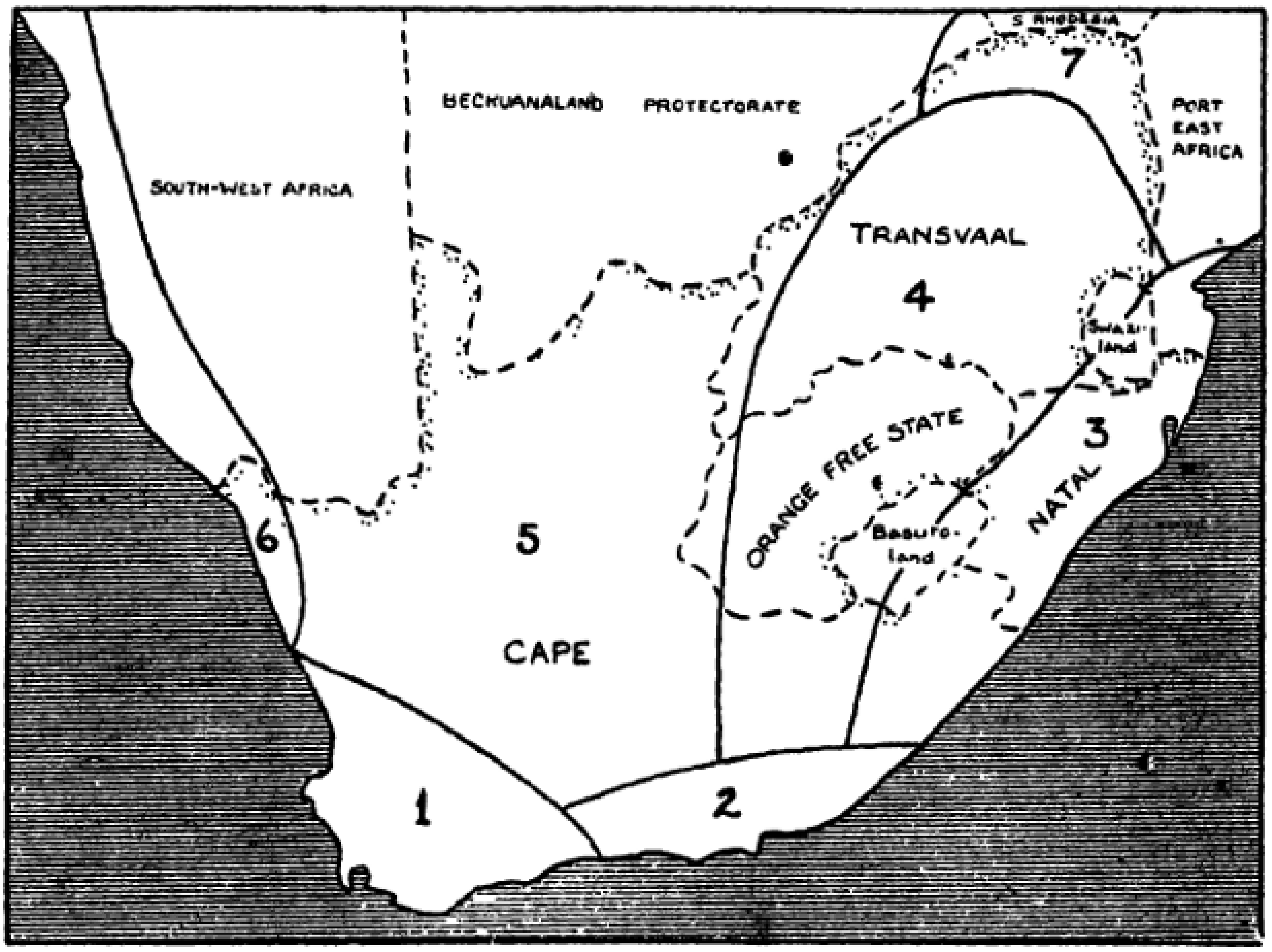


FIG. 182: BROAD NATURAL REGIONS OF THE UNION OF SOUTH AFRICA.

THE WESTERN INTERIOR AND THE KARROOS have a hot climate and a small rainfall, and in the west and north-west pass into semi-desert. The vegetation is mainly poor grass, but large numbers of cattle, sheep, and goats are reared, while on the Little Karroo tobacco and lucerne are grown. The rearing of ostriches has declined owing to changes in fashion.

THE NORTH-WEST COASTAL AREA (Namaqualand) is a desert region.

THE LOW VELD lies within the Limpopo Basin, and occurs in the Union only in the extreme north and north-east of the Transvaal. The climate is unhealthy with a low rainfall. Forests exist only along the river banks, and elsewhere the vegetation is scrub.

Pastoral Industry in the Union

The pastoral industry, and particularly the rearing of sheep for the production of wool, is the mainstay of the farming activities of the Union, but periodic droughts are a serious disadvantage. The factors favouring pastoral farming are the relatively dry climate and the large areas of natural pasture. Cattle are reared mainly in the wetter east, sheep chiefly to the west and south of the main cattle belt and goats largely in the drier west.

Sheep are found mainly in Cape Province, on the Karroos and in the south-east, the leading centres being *Graaff Reinet*, *Somerset East*, *King William's Town* and *Queenstown*. *Uitenhage* is the greatest wool-washing centre and *Port Elizabeth* the leading wool port of the country. The order of importance of the remaining provinces with regard to sheep is (1) the Orange Free State, (2) the Transvaal and (3) Natal. The Cape and the Orange Free State together account for about five-sixths of the total number of sheep, which are of the merino breed.

The Union has a large export of wool, mainly to Britain, but no export of mutton. Animal diseases and the lack of water are great difficulties which the South African farmer has to combat, but they are being overcome by systematic "dipping" of the sheep and by the storing of water for the dry season.

Cattle, although numerous, are of considerably less importance than sheep. The main cattle area lies on the High Veld in the wetter eastern part. The cattle are reared mainly for draught purposes as, in South Africa, horses are readily attacked by disease. There is a small export of beef, whilst hides are exported in large quantities and dairying is growing in importance both in Cape Province and in Natal.

Irrigation has enormously increased the prospects of the dairying industry, and the relative nearness of South Africa to the British market gives it a marked advantage over Australia, but the full development of the industry depends very largely on the extension of co-operative methods of organisation, such as are applied in other Dominions and in Denmark.

Goats are reared in Cape Province in large numbers and to a less extent in Natal and the Transvaal. They thrive on pastures too poor for sheep and are reared mainly by the Kaffirs for their flesh, though in the Graaff Reinet-Cradock district of the Great Karroo there are large herds of "angora" goats, which are reared for their long white "mohair." Angora hair is greatly valued for its silken texture and is used with wool and cotton in the manufacture of fine dress materials. Nearly all the mohair is exported to Bradford in England.

Horses, Mules, Asses, Pigs and Ostriches also are reared in different parts of the Union. The pigs are reared chiefly by Kaffirs in Cape Province, and, in view of the production of maize in the Union, there [illegible]ould be a future for the bacon industry if it is properly organised and developed. Ostriches are reared for their feathers chiefly on the Little Karroo in Cape Province around *Oudtshoorn*, *Uitenhage* and *Grahamstown*, but, as the feathers are by no means as fashionable as they were at one time, the industry is now of less importance than it was and much of the land occupied by ostrich farms might profitably be used for dairying or for the production of tobacco.

Agriculture

The growing of crops is not so important in the Union as the pastoral industry. Although much of the land is fertile, the great drawback is a scarcity of water in the dry season, whilst every year in the wet season much of the best soil is washed away by river floods. These disadvantages are being partly overcome by various methods of collecting and conserving water, including damming the rivers, the construction of tanks and the boring of artesian wells.

MAIZE is by far the most important crop in the Union. It is not only the chief food of the Kaffirs but also constitutes an important export. It is cultivated mainly in the "maize triangle" of the northern Orange Free State and the southern Transvaal (Mafeking-Middleburg-Bloemfontein), where there is summer rainfall (not excessive, but rarely below 15 ins.) and a hot ripening period. Maize is grown also in both Natal and Cape Province.

WHEAT is grown mainly in the Mediterranean region of Cape Province, where the chief centres are Paarl, Malmesbury and Caledon. Considerable quantities are grown in the Orange Free State and the Transvaal, but the wet summers of Natal are unfavourable to the crop. The Union's total output of wheat is now sufficient for local requirements.

BARLEY, OATS and RYE are grown in the wheat districts in small quantities, whilst the cattle-rearing areas grow oats for fodder.

FRUITS are extensively grown in considerable variety (thanks to the variation in altitude and climate) and the Union's export trade in fresh, tinned and bottled fruits is expanding rapidly. The sub-tropical region of Natal produces bananas and pineapples, whilst elsewhere plums, pears, apples, apricots, peaches, oranges, lemons and melons are grown, especially in the South-West Mediterranean region. The vine also is cultivated in this region, principally in the rich lands round Paarl, Worcester, Stellenbosch and Malmesbury, whence there is a growing export of grapes, raisins, wine and brandy. The wine industry shares with that of Australia the difficulty of overcoming prejudice in favour of the old-established European wines, but steady progress is being made and the export to Britain is rapidly increasing.

TOBACCO is grown widely throughout the country both for local consumption and for export. Virginia leaf is cultivated chiefly in the Pretoria, Rustenburg, Marico, Potchefstroom and Piet Retief districts of the Transvaal and the Piquetberg and Oudtshoorn districts [illegible] Cape Province. The Mediterranean region produces Turkish leaf, the chief centres being Stellenbosch, Wellington and Tulbagh.

SUGAR-CANE is becoming of increasing importance on the sub-tropical coastal plain of Natal and there is a surplus available for export. The industry was developed with the aid of imported Indian labour as the local labour supply was inadequate and unskilled, but now the labour is almost entirely supplied by natives of the Union.

COTTON is cultivated on a moderate scale, in spite of advantages such as a large supply of cheap native labour, a favourable climate and excellent shipping facilities. The leading areas of cultivation are in Natal and Zululand, and the Rustenburg district of the Transvaal.

TEA cultivation, also, was developed with the aid of cheap, skilled Indian labour on the coastal lands of Natal, but the crop is expensive to produce and, as the immigration of Indians has since been restricted, the industry is declining in importance.

Minerals of the Union

GOLD and DIAMONDS.—The Union has great mineral wealth, notably in gold and diamonds (see Chapter 13). Over 50 per cent. of the annual world gold output is obtained from the Witwatersrand in the Transvaal, with Johannesburg as the centre.

The principal diamond mines are at Kimberley (the most important) in the north-east of Cape Province; Jagersfontein and Koffiefontein in the Orange Free State; and around Pretoria in the Transvaal.

COAL is mined in the Transvaal (at Witbank, Boksburg, Vereeniging and Middelburg); in Natal (at Dundee and Newcastle), and to a lesser extent in the Orange Free State and Cape Province. Much of the coal from Natal is used for bunkering at Durban and for export, whilst in the Transvaal it is used mainly to supply power for the gold mines and railways. Indeed, were it not for the cheapness of the coal, the gold industry could not continue because of the high cost of extracting the ore.

COPPER is mined in Cape Province at Ookiep and Concordia, but mainly in the Transvaal at Messina.

OTHER MINERALS include asbestos from Cape Province and corundum from the Transvaal, while vast but largely undeveloped resources of iron ore exist in Natal and the Transvaal. Platinum also has been found in the Transvaal.

Manufactures

M[illegible]ufactures are not of great importance in the Union, and those whi[illegible] exist are mainly connected with the preparation for export of the [illegible]ucts of the agricultural and pastoral industries. They include the preparation of wine and brandy, fruit canning, sugar-refining, wool-washing, and industries relating to tobacco, cotton and wattle bark extract. In addition there are railway workshops, explosives factories, vehicle works and harness factories, whilst most of the larger towns have miscellaneous local manufactures. Cape Province has the largest number of industrial establishments, followed by the Transvaal, Natal and the Orange Free State in the order named.

Communications

As natural means of communication are negligible in the Union, the railways assume increasingly great importance. The total railway mileage is about 13,100 miles, of which 12,216 miles have the 3 ft. 6 in. gauge. The main lines link the principal ports (Cape Town, Port Elizabeth and East London in Cape Colony; Durban in Natal; and Lourenço Marques in Portuguese East Africa) with the interior mining and agricultural centres. These ports are the great gateways of the country's trade and the four Union ports, together with the railways, are under the control of the Union Government. The Portuguese port of Lourenço Marques is an important outlet for the Transvaal.

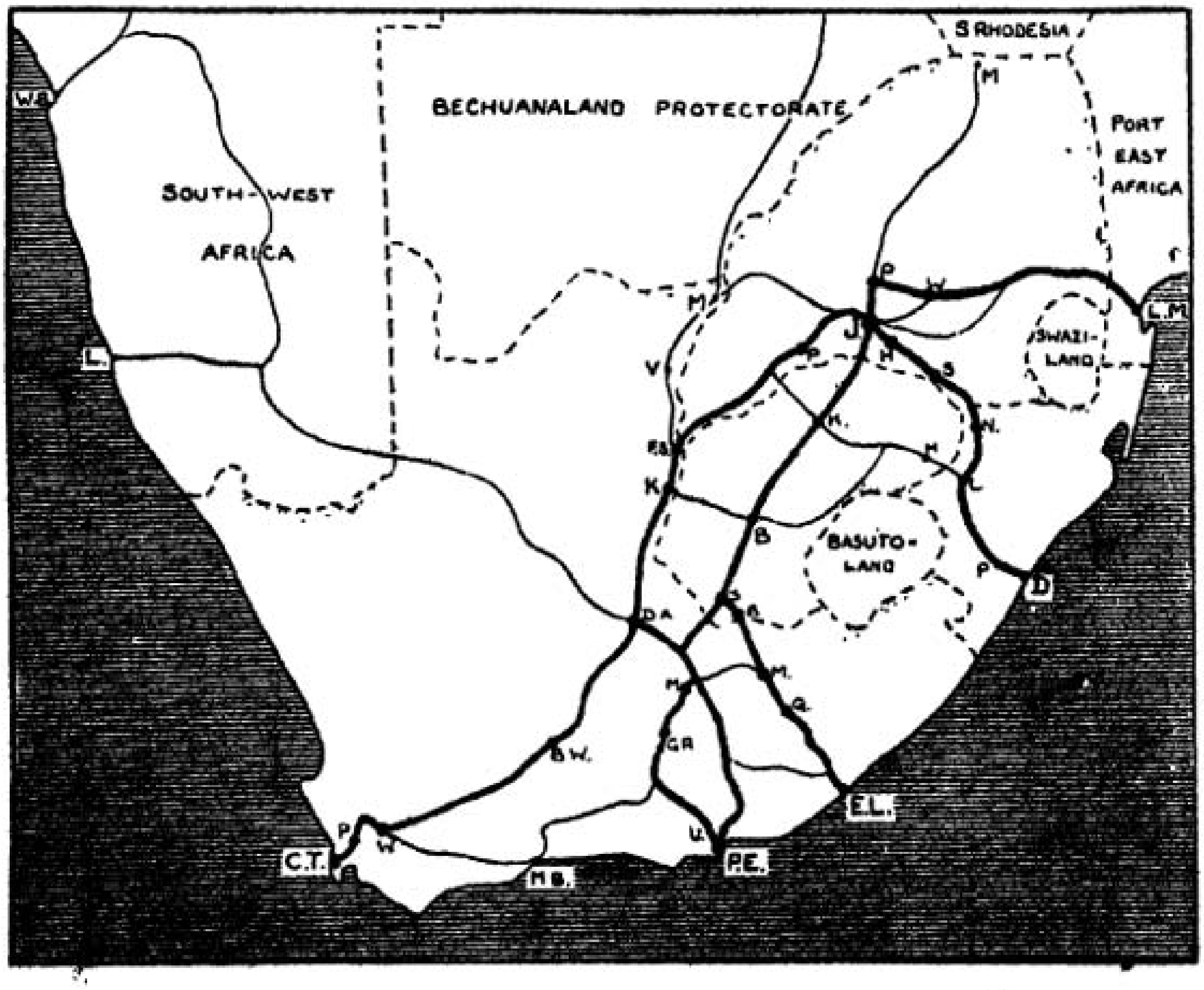


FIG. 183: THE PRINCIPAL RAILWAYS OF THE UNION OF SOUTH AFRICA.

Commerce of the Union

In point of value, gold is by far the most important *export* of the Union. Next follow wool, diamonds, maize, hides, skins, bark, coal and butter. The leading *imports* are food and drink, cotton goods, machinery, motor-cars, oil, hardware, electrical goods, clothing, chemicals, iron and steel goods. Much of the total trade is with the United Kingdom.

PROVINCES OF THE UNION

The Cape of Good Hope Province

The Cape Province, lying to the extreme south of the Union, has an area of 276,536 sq. miles and a population of about 3,000,000. It consists physically of a fertile *coastal plain* rising to the *Karroos* and thence to the *High Veld.* The chief products are clearly identified with the natural regions:

(1) THE MEDITERRANEAN SOUTH-WEST is a mountainous region with a Mediterranean type of climate. The mountain slopes are covered with scrub and the wetter parts are forested, the chief agricultural areas being the cultivated valleys. The production of Mediterranean fruits, wine, apples and pears is important, particularly around the market centres of *Worcester*, *Paarl*, *Wellington* and *Stellenbosch*, and there is a growing export of fresh, canned and dried fruits, wine and brandy. The climate is favourable to the production of wheat and the region is the leading wheat producer in the Union, whilst tobacco also is grown. *Cape Town* (see Chapter 16) is the capital and principal port of the Province as well as being the legislative capital and the leading port of the whole Union. *Mossel Bay* has a sheltered harbour and access to a fertile hinterland through gaps in the highlands.

(2) THE SOUTH is a sub-tropical region which extends to the west of Natal (see p. 525). It is one of the chief cattle-rearing areas of the Union, and cultivates maize, citrus fruits and tobacco. *Port Elizabeth*, on Algoa Bay, exports wool, hides, skins, mohair and ostrich feathers. *East London*, the port for the east of Cape Province, exports wool, hides and skins. *Uitenhage* is a fruit-growing and wool-washing centre and also has large railway repair shops.

(3) THE GREAT AND LITTLE KARROOS are mountain-girt plains with a low and irregular rainfall. Vegetation is sparse and pastoral farming is naturally the leading occupation, sheep, cattle, goats and ostriches all being reared. There is a growing production of beef and dairy produce with the development of irrigation, and wheat and tobacco are grown in small quantities. *Beaufort West*, a sheep-farming centre, is the chief town. *Graaf Reinet* is a wool-collecting centre.

(4) THE UPPER KARROO is situated north of the escarpment at a height of over 3,000 ft. above sea-level. The temperature is one of extremes, the rainfall low and intermittent and the summers hot and dry. The vegetation is consequently sparse, entirely lacking in trees, and supports only small numbers of sheep and goats. There are no large towns.

(5) Namaqualand is a coastal desert extending westwards from the Karroo and is important only for its copper deposits near *Ookiep*. *Port Nolloth*, south of the Orange River, is the copper port.

(6) The Kalahari Thorn Region extends into Cape Province. Here again there are extremes of temperature, a low rainfall and a vegetation consisting of thorn bush and scattered grass. Cattle, sheep and goats are reared, more especially in the wetter east, but the chief wealth of the region is in its diamond mines centred around *Kimberley*. *Mafeking* is the chief centre of the pastoral industry.

(7) The High Veld. Only a small part of Cape Province, south of the Orange Free State, is situated on the high veld. There is a large number of cattle and sheep, whilst a little wheat and maize are cultivated.

The principal *exports* of Cape Province are diamonds, wool, hides, skins, mohair, ostrich feathers, copper and fruit; the main *imports* consist of foodstuffs, textiles, iron and steel goods and machinery.

As is the case with all the Union States, much of the trade is with the United Kingdom.

Natal

Natal, with an area of 35,284 sq. miles and a population of 1,500,000, is situated on the south-east coast of the Union, and rises from a hot coastal plain to the lofty Drakensbergs. The climate is generally of the warm temperate type, being sub-tropical on the coast but cooler in the elevated interior. The rainfall is abundant with a summer maximum.

The Coastal Region has a sub-tropical climate and a fertile soil. It produces sugar, maize, Kaffir corn, wattle, tropical and sub-tropical fruits (bananas, pineapples and citrus fruits). The cultivation of tea and cotton is declining. There are numerous cattle and dairying is increasing in importance. *Durban* (Port Natal), the chief port, has a good landlocked harbour and a productive hinterland which includes the Transvaal and the Orange Free State. It is an important coaling station and exports coal, wool, sugar, maize, wattle, fruits, hides, skins, meat and dairy produce. The chief imports are general merchandise, timber, grain, railway material and petroleum.

The Central Region, lying between the coast and the edge of the plateau, has less rain than the coastal belt and produces chiefly Kaffir corn and wattle. It is mainly important for its coal deposits in the Newcastle–Dundee area, much of the coal being sent to Durban for bunkering purposes and for export. *Pietermaritzburg* is the capital and chief railway centre of Natal.

The Mountain Region, including the lofty Drakensberg Mountains, is noted for its fine scenery. The slopes are grass-covered, with forests in sheltered areas, and there are large numbers of sheep and cattle. The relief, which does not favour arable farming, has been a great obstacle to communication. *Ladysmith*, the chief town of the region, is a railway centre.

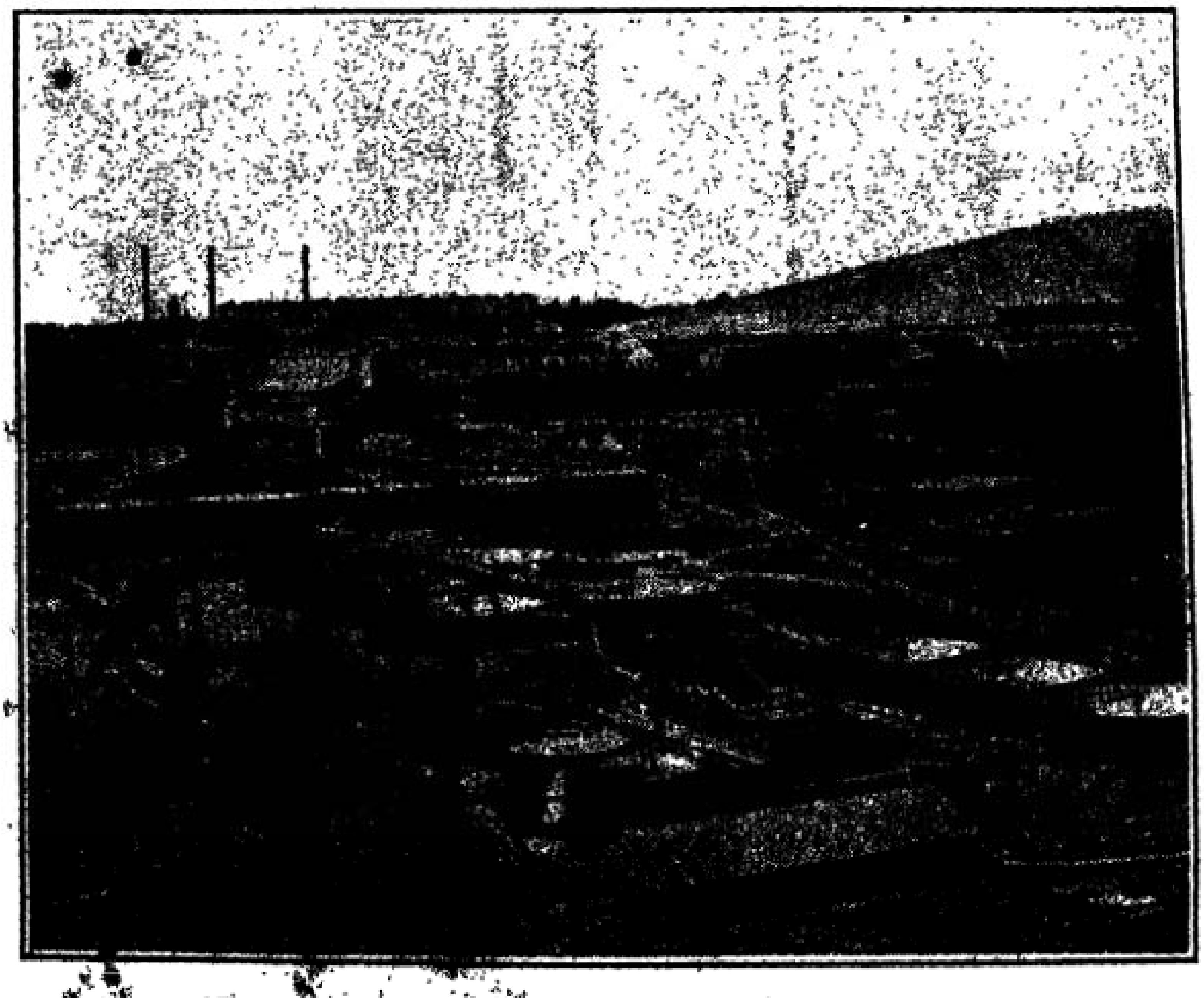
The *exports* of Natal as a whole include maize, wattle bark (for tanning), coal, gold (from the Transvaal), hides, wool and sugar. The *imports* consist mainly of manufactured goods.

Transvaal

The Transvaal has an area of 110,450 sq. miles and a population of 2,200,000. It is in the main an inland plateau and a temperate grassland country, lying between the rivers Vaal and Limpopo. The north-east comprises the hot, unhealthy *low bush veld*, about 3,000 ft. above sea-level, with summer rainfall. The *plateau* proper, over 4,000 ft. high, lies in the south, and has hot summers and cold winters, with adequate rainfall. The plateau *slopes* (*banken*) between 3,000 and 4,000 ft. have a warm temperate climate and sufficient rainfall.

Broadly, two natural regions may be distinguished: (1) the High Veld, and (2) the Bush Veld.

THE HIGH VELD occupies the southern part as far north as Pretoria. It is a region of extremes of temperature and decreasing rainfall from east (40 ins.) to west (15 ins.) and consequently the vegetation is mainly of the grassland type. Stock-raising is important, including large



[By courtesy of the South African Railways and Harbours Publicity Dept., Johannesburg.

ONE OF THE WORLD'S GREATEST SOURCES OF GOLD: THE CROWN MINES OF JOHANNESBURG.

numbers of sheep and cattle, and there is an extensive production of maize. The chief wealth of the region, however, is in its minerals, including the famous gold mines of the Rand, and coal at Witbank and Middelburg. *Johannesburg* is the principal town of the Transvaal and the largest and richest town in the Union, as well as an important railway centre. It owes its growth and importance solely to the adjacent gold fields, though it now has a variety of manufactures, including beer, tobacco and bricks. *Germiston*, lying nine miles east of Johannesburg, is an important rail, air and industrial centre.

THE BUSH VELD has higher temperatures owing to decrease in latitude and altitude. It slopes down to the Limpopo River, where the climate becomes tropical and malarial, whilst rainfall decreases from east to west. On the whole, the region is the best ranching country in the Union and cattle-rearing is an important occupation. The chief arable products are maize, citrus fruits, cotton and ground-nuts. The mineral wealth includes copper at Messina, iron in the Rustenberg district, diamonds near Pretoria and asbestos in the Lydenberg and Barberton districts. *Pretoria* is the capital of the Transvaal and the administrative capital of the Union. It is a railway centre with railway workshops and a developing iron and steel industry.

The *exports* of the province include gold, wool, hides. skins, maize, and diamonds ; while the *imports* are chiefly iron and steel goods, machinery, textiles and foodstuffs.

As the Transvaal is an entirely inland territory, the absence of a port is a great drawback, and, although some trade is carried on through Durban, the natural outlet of the country is through the Portuguese port of *Lourenço Marques* on Delagoa Bay.

Orange Free State

The Orange Free State (*area :* 49,647 sq. miles ; *population :* 650,000) lies south of the Transvaal between the Vaal and the Orange rivers, and, like the Transvaal, is an inland country. It lies for the most part on the High Veld, and has a healthy temperate climate with an irregular rainfall. The periodic droughts and swarming of locusts are great drawbacks. The wetter eastern parts are given over to agriculture, the principal crop being maize. The drier west is pastoral and supports cattle, sheep, horses and goats. Wheat, apples and wattle bark also are produced.

The Kimberley diamond field extends over the border in the west, and has *Jagersfontein* as its principal centre. In the north, coal is found on a continuation of the Transvaal field.

Bloemfontein, the capital of the Province, is an important railway centre and is connected with Kimberley, Pretoria, Durban, East London and Port Elizabeth. *Ladybrand* is a wheat centre, and *Harrismith* an important trading centre.

The *exports* of the Orange Free State include diamonds, wool, hides and skins ,while the *imports* are largely manufactured goods such as textiles, iron and steel goods, and machinery.

Territories Under the South African High Commission

BASUTOLAND (*area :* 11,716 sq. miles ; *population :* 500,000, including 496,000 natives) is an inland mountainous country comparable with Switzerland. It lies between the Orange Free State, Natal and Cape Province and is enclosed by the Drakensbergs. It has a good climate and is well-watered, with excellent grain-growing land and abundant grass for stock-raising. The export products are wool, mohair, wheat, maize, Kaffir corn, cattle and horses. The capital is *Maseru.*

BECHUANALAND PROTECTORATE (*area :* 275,000 sq. miles ; *population* : 153,000, including 151,000 natives) stretches from the Orange to the Zambesi. It is part of the African plateau, with a fairly healthy climate. The country is grassland in the east, but it gets drier westward, and finally passes into the dry and sandy Kalahari desert. The natives rear cattle, sheep and goats in the wetter parts, but the rainfall is too small and uncertain for agriculture. The protectorate is administered from Mafeking (Cape Province) and is traversed by the Cape-Cairo railway in the east.

SWAZILAND (*area :* 6,705 sq. miles ; *population :* 113,000, including 111,000 natives) is surrounded by the Transvaal except in the east, where it touches Natal and Mozambique. The country rises from the Low Veld (1,000 ft.) in the east, through the Middle Veld to the mountainous High Veld (4,000 ft.). The lower parts are malarial, but the climate improves with increasing altitude, and the higher parts are well-watered and fertile. Much of the land is therefore productive, both pastoral and agricultural occupations being important. Minerals are present but are not much exploited.

The principal exports are tin, cattle, tobacco and cotton. The capital is *M'babane.*

South-West Africa

South-West Africa (*area :* 317,725 sq. miles ; *population :* 275,000, including 242,000 natives) is administered under a mandate by the Union Government. It has a sandy coastal plain, rising inland in plateau formation, and then falling to the Kalahari desert. The rainfall is generally scanty and the region is largely desert. The chief occupations are cattle rearing and sheep rearing, though diamond mining and copper mining are carried on in certain places.

The Province is served by railway from the Cape, while *Windhoek*, the capital, *Walvis Bay*, the chief port, and *Luderitz Bay*, the diamond port, are all being connected by rail.

The principal *exports* are diamonds, copper and hides, while the *imports* are mainly food and manufactured goods.

THE RHODESIAS AND NYASALAND

The Rhodesias include that part of the South African plateau which extends northwards from the Transvaal to the Belgian Congo and Tanganyika, and eastwards from Mozambique, Nyasaland and Tanganyika to Bechuanaland, Angola and the Belgian Congo. The country lying to the south of the Zambesi River is known as *Southern Rhodesia* and that to the north as *Northern Rhodesia*. Southern Rhodesia has an area of 150,344 sq. miles and a population of about 1,100,000, whilst Northern Rhodesia has an area of 287,950 sq. miles with a population of about 1,400,000. In both cases the whites number only a few thousands.

Southern Rhodesia

Southern Rhodesia is a self-governing colony divided into a north-eastern part known as ***Mashonaland*** and a south-western part called ***Matabeleland***. Most of the country has an elevation of over 3,000 ft., but the divide between the Zambesi and Limpopo rivers rises to 4,000-5,000 ft. above sea-level, whilst the river valleys fall to less than 1,000 ft. Except in the lowest parts, therefore, the climate is temperate and healthy, in spite of the low latitude.

Southern Rhodesia receives most of its rainfall in the summer months, the quantity decreasing from east to west.

The climatic conditions generally are suitable to cattle-rearing, and dairying is well-established. Large areas are devoted to the cultivation of maize, cotton and tobacco, while ground nuts, winter wheat and fruit also are grown. The cultivation of oranges and lemons is extending rapidly.

At present, mining is the most important industry, the principal minerals being, in order of value, gold (Bulawayo, Gwelo, Victoria and Umtali), by far the most important; asbestos (Victoria); chrome ore (Selukwe); coal (Wankie); and copper (widely distributed).

Salisbury, the capital, is connected by rail with *Bulawayo*, the chief railway centre, and with its outlet to the sea, the port of *Beira* (Mozambique). The Cape-Cairo railway runs through Bulawayo and Wankie, the latter providing the coal for use on this part of the railway and for power purposes in the Katanga copper mines in Belgian Congo.

The *exports* of Southern Rhodesia are mainly gold, asbestos, chrome ore, tobacco, maize and animals for slaughter. The *imports* comprise manufactures (textiles, apparel, motor cars, iron and steel goods and machinery), provisions and beverages.

The trade is largely with Great Britain.

Northern Rhodesia

Northern Rhodesia is a British Protectorate consisting mainly of high plateau country, covered with thin forests, but with large areas which as yet are imperfectly known. The temperature is relatively high and the rainfall abundant, making the country less suitable than Southern Rhodesia for white occupation.

Stock-raising is the chief industry, large numbers of cattle being reared, while maize, tobacco, cotton, wheat and European fruits are cultivated. There is much mineral wealth, including copper (Bwana M'Kubwa), lead and zinc (Broken Hill), as well as silver, gold and coal.

The country is served by the Cape-Cairo railway which runs from Livingstone in the south through Broken Hill in the centre on its way to Elizabethville in the Belgian Congo.

Livingstone, the capital and a farming centre, is situated on the Cape-Cairo railway near the wonderful *Victoria Falls*, and is thus an important tourist centre. *Broken Hill*, also on the railway, is an important mining centre. The only other towns of importance are *Fort Jameson*, on the Nyasaland frontier, and *Abercorn*, near the southern end of Lake Tanganyika. *Lusaka*, 65 miles south of Broken Hill, has been selected by the Government as the site for a new capital to supersede Livingstone.

The main *exports* of Northern Rhodesia are zinc, copper, tobacco, maize, hides, skins, lead and timber. The *imports* consist mainly of provisions and manufactured goods.

Nyasaland

Nyasaland, a British Protectorate lying along the western and southern shores of Lake Nyasa, has an area of 37,596 sq. miles and a population of 1,610,000, including 1,606,000 natives. The whole area is elevated, with fairly hot, wet summers, and cool, dry winters. Vegetation is of the savannah type, agriculture being the chief industry, though stock-rearing also is carried on.

Large crops of tea and tobacco are produced in the *Shiré Highlands*, while coffee, maize and cotton also are cultivated. These products constitute the main *exports*. The *imports* are mainly provisions and manufactured goods and the trade is almost entirely with Britain.

A railway runs from Beira (Mozambique) through *Port Herald* on the Shiré river to *Blantyre*, the chief settlement. This line is to be extended to *Zomba*, the capital, and to *Fort Johnson* on Lake Nyasa.

EAST AFRICA

Portuguese East Africa

PORTUGUESE EAST AFRICA, or MOZAMBIQUE (*area*: 297,657 sq. miles; *population*: 4,000,000), is a coastland country extending from Delagoa Bay in the south to Cape Delgado in the north, and including the lower courses and deltas of the Zambesi and Limpopo rivers.

It is a monsoon area consisting of a hot, swampy, unhealthy and forested coastal plain, except in the north, where the interior, owing to its elevation, is cooler and drier. Agricultural development has been slow owing to inefficient administration and a shortage of labour. The principal products and exports are sugar, groundnuts, coconut products and sisal hemp.

There are several good harbours including the capital *Lourenço Marques*, which is also the port for the Transvaal; *Beira*, with a railway to Salisbury and Bulawayo, and at the eastern end of the east-west "transcontinental" line; *Chinde* on the coast near the mouth of the Zambesi, and *Mozambique*, also on the coast, opposite Madagascar.

British East Africa

This region includes KENYA COLONY AND PROTECTORATE bordering Abyssinia and Italian Somaliland; the UGANDA PROTECTORATE to the north of Lake Victoria; the ZANZIBAR ISLAND PROTECTORATE near the coast in the Azanian Sea, and the mandated TANGANYIKA TERRITORY between Lake Tanganyika and the Azanian Sea coast.

Most of this area is a plateau region rising from the coast to between 3,000 and 6,000 ft. above sea-level. It is crossed from north to south by the great rift valleys already mentioned (see p. 517), while volcanic peaks (such as Mt. Kenya and Mt. Kilimanjaro), some still active, tower above the plateau.

The temperature necessarily varies with altitude but is everywhere uniform throughout the year, and, except on the low equatorial coastland, the equatorial climate is modified by elevation and is fit for white settlement. The rainfall is variable, as regards both season and amount, being heaviest during the northern spring and autumn.

KENYA (*area:* 224,960 sq. miles; *population:* 3,000,000), the northern coastal Colony, can be divided into three natural regions: (1) the Coastal Plain; (2) the Northern Plain, rising to a height of 3,000 ft.; and (3) the Interior Plateau, over 4,000 ft. in height.

The Coastal Plain is little developed as it is not suitable for white settlement. The leading products are rice, cotton, coconuts, groundnuts and sugar.

The Northern Plain is semi-desert and of little economic importance.

The Plateau is suitable for white settlement and produces wheat, barley, maize, coffee, flax and sisal hemp, while stock-raising is increasing in importance. The temperate forests of the interior and the minerals of the Colony are still unexploited, except for the soda deposits at *Magadi*, south of Nairobi, and the recently discovered gold mines near Kakamega.

The principal means of communication is the Kenya and Uganda Railway in the south, which links Mombasa, on the coast, with (*a*) *Nairobi*, the capital, situated on the plateau 300 miles from the coast, (*b*) *Kisumu* on the north-east point of Lake Victoria, and (*c*) *Kampala*, in Uganda. Air transport is becoming important (see Chapter 19).

Mombasa, situated on a coral island of the same name, is the largest town in British East Africa and includes the harbour of *Kilindini*, which has the finest land-locked harbour on the east coast of Africa.

Kenya's *exports* include coffee, fibres, maize, hides, skins, seeds and carbonate of soda. The *imports* include textiles, iron and steel goods, machinery, motor cars, provisions and manufactured tobacco.

Over 60 per cent. of the trade is with the Empire.

UGANDA (*area :* 94,204 sq. miles ; *population :* 3,500,000) is a high plateau area situated north of Lake Victoria and west of Kenya, between the two rift valleys. The whole area is over 3,000 ft. above sea-level, and the climate, which would otherwise be equatorial, is tempered by altitude. The most important product and *export* is cotton, which is grown almost entirely by natives. Other exports are cotton seed, coffee, rubber, hides, skins, tin and ivory. In the lower forested regions bananas and oil palms are plentiful.

The Busoga Railway runs northwards from Jinja, on Lake Victoria, to Namasagali, which is the highest point on the Nile reached by steamers. The Kenya and Uganda Railway (see page 275) provides the main outlet for the Uganda cotton crop, the crop being sent by rail and steamer to Kisumu and thence by rail to Kilindini.

Entebbe, the administrative capital, is situated on the north-western shore of Lake Victoria, and is served by steamer from Kisumu. *Kampala* (*Mango*), the native capital, is situated on Lake Victoria north of Entebbe and is a station on the air route between London and the Cape.

TANGANYIKA (*area :* 360,000 sq. miles ; *population :* 5,000,000) is a territory situated south of Kenya and administered under mandate by Britain. It formerly constituted German East Africa. It consists of a coastal plain gradually rising to a plateau about 4,000 ft. above sea-level.

The tropical coastal margin has forests containing ebony and bamboo, and yielding beeswax, wild rubber and gum copal. In the clearings coconuts, vanilla, sisal, rubber, rice and sugar-cane are grown, while on the higher ground coffee and cinchona are produced. Maize, cotton and tobacco are cultivated on the plateau, where stock-raising is an important native industry. Gold and mica are mined.

There are railway lines from *Dar-es-Salaam*, the capital and chief port, to *Kigoma* on Lake Tanganyika, and from *Tanga*, a port, to *Moshi* and *Arusha*, with a branch to Kenya.

The main *exports* are sisal, cotton, coffee, hides, skins, ground-nuts, grain, copra and beeswax. The *imports* include cotton goods from Britain, foodstuffs from India and miscellaneous manufactures.

ZANZIBAR (*area :* 1,100 sq. miles ; *population :* 235,000) includes the islands of Zanzibar and Pemba, together with the small adjacent islands lying off the coast of Tanganyika in the Azanian Sea (Indian Ocean). These islands have a hot, moist climate and produce the bulk of the world's supply of cloves, the only other important export being copra.

Zanzibar, the capital and port, is on the west coast facing the mainland. It has a large entrepôt trade, importing goods for transhipment to the mainland and re-exporting much of the produce of Tanganyika.

Somaliland

British Somaliland (*area* : 68,000 sq. miles ; *population* : 350,000), situated on the Gulf of Aden, is a barren, undulating plateau given over to stock-raising. It exports hides and skins. The capital is *Berbera*.

Italian Somaliland (*area:* 194,000 sq. miles ; *population:* 1,000,000), stretches south from Cape Guardafui along the coast to the Equator. The occupations are cattle-rearing and arable farming. The *exports* include sesame oil, gum, hides, butter, cotton, cotton-seed oil, resin and ivory. *Mogadishu* is the capital.

Transport in Abyssinia.

Though the natives of Addis Ababa use modern corrugated iron for their buildings, the camel is still the means of transport to-day as it was hundreds of years ago.

French Somaliland (*area* : 8,880 sq. miles ; *population* : 70,000), situated north of British Somaliland, is commercially unimportant. The capital and port is *Djibouti*.

Eritrea (*area* : 45,754 sq. miles ; *population* : 600,000), is an Italian colony situated in the Red Sea, north of French Somaliland. The coastal lowlands are tropical with a low rainfall, whilst the uplands have a cool climate with summer rain. The country is of little economic importance. The capital is *Asmara* and the port is *Massawa*, which is an outlet for Abyssinian trade.

Abyssinia

Abyssinia (*area* : 350,000 sq. miles ; *population* : about 5,500,000), is a small independent Empire surrounded by the Sudan, Kenya and

Somaliland. The country is practically all high land, deeply cut by the Blue Nile and Atbara gorges, with a tropical climate on the lower lands, and decreasing mean temperature and greater extremes as the land gets higher. The greatest rainfall is received in the summer months, when a monsoonal effect is produced by the low pressure area over the Sahara.

The *exports* include civet (perfume), coffee, hides, skins, wax, gums, ivory and native butter. The main *imports* are manufactured goods, petroleum, salt and glass.

The principal trading countries are Britain, France, India and Italy, much of the trade passing through the Sudan.

Abyssinia's only railway line runs from Djibouti on the Gulf of Aden in French Somaliland to *Addis Ababa*, the Abyssinian capital, situated on the plateau in the centre of the country. The general backwardness of the country is illustrated by the fact that this line runs only twice weekly in each direction, does no night travelling and takes 3 days to cover the whole journey of only 488 miles.

EGYPT AND THE SUDAN

Egypt

Egypt (*area :* 383,000 sq. miles ; *population :* 14,200,000) is largely a desert area situated in north-east Africa, cut in the east from north to south by the fertile Nile valley. Between the valley and the Red Sea are the *Nubian Desert* and the *Arabian Desert*, while on the west, merging into the Sahara, is the *Libyan Desert.*

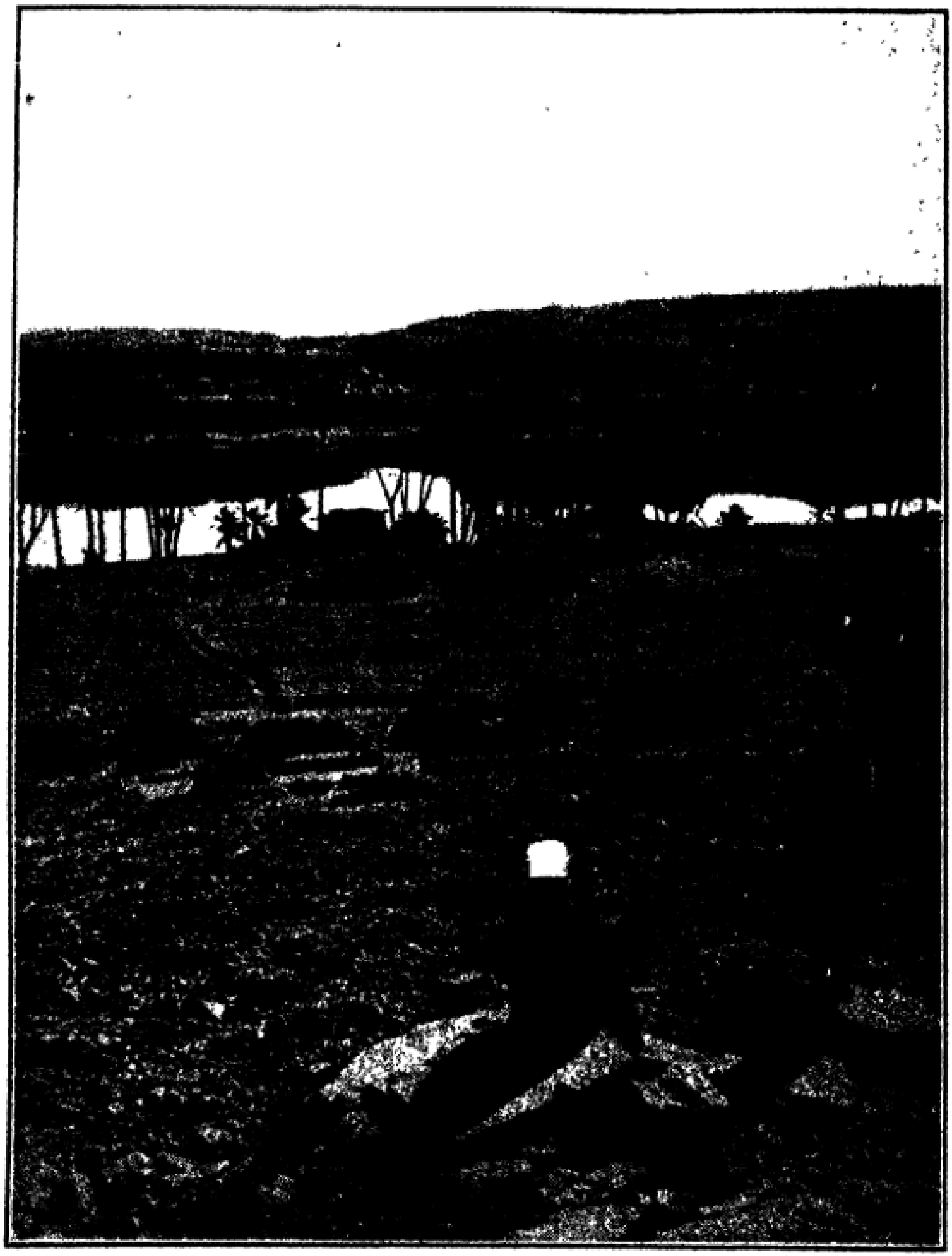
Except in the extreme north, which enjoys a Mediterranean climate, the climate is of the desert type, with daily and seasonal changes, and subject to the *khamsin*, the hot, dust- and sand-laden cyclonic wind which blows outwards from the desert towards the sea.

The basin of the Nile is a fertile flood plain culminating in a large delta stretching from Cairo to Alexandria. The whole area is inundated annually in the late summer by the flood waters brought down by the Abyssinian tributaries from the mountains which, in summer, receive heavy equatorial rains. Every year the river rises from June to September, after which it falls rapidly until November.

Irrigation is extensively practised. Originally it was of the *basin* type, that is, the water was allowed to flood over the surrounding land each year. This resulted in the deposit of a layer of fertile silt over the land surface, but the area affected was comparatively small and much water was wasted. *Dams* and irrigation *channels* have now been constructed so that the flow can be regulated and artificial fertilisers used. The most important irrigation systems are those based on the Delta Barrage near Cairo, the Assiut Barrage, the Nagh Hamadi Barrage, the Esna Barrage and the Aswan Dam.

The country may be divided regionally into three divisions : (1) the *Nile Valley* ; (2) the *Nile Delta* and (3) the *Desert* (see Fig. 132). Almost the whole population is centred in the valley and on the delta of the Nile, which are the only economically important parts of the country, and are entirely dependent on the river for their productivity.

The Valley and Delta Regions. The valley has a desert climate but the delta is on the borders of the Mediterranean region and has some rain in winter. By means of irrigation it is possible to grow crops all the year round. Cotton and sugar cane are cultivated in the summer;



[*Photo by W. F. Taylor.*

THE FERTILE NILE 'MID THE BARREN WASTES OF EGYPT.

A section of the Nile Valley showing the irrigation channels crossing the fields and the circular threshing pans. The banks of the river are lined with palms but beyond the irrigated fields the land is an arid waste.

rice and maize in the autumn, and wheat, beans, barley and clover in winter. Maize and wheat occupy the largest acreage and maize is the chief food crop. Cotton is next to maize and wheat in acreage and is the great "money" crop, providing Egypt with the bulk of her exports. There are few industries apart from the weaving of cotton goods for local needs, the extraction of oil from the cotton seeds and the manufacture of cigarettes.

THE DESERT AREAS are productive only in the oases, where typical products such as dates are produced. A little petroleum is obtained in the west near the Red Sea and phosphates from Isna and Kosseir.

The Nile itself is a highly important means of communication (it is easily navigable to Wadi Halfa), while all roads and railways follow its valley. From Alexandria, the railway runs west of the delta to Cairo and thence follows the river to Asyut and Aswan. There is then a break as far as Halfa, whence the railway continues into the Sudan. Cairo is linked up with *Damietta*, on the east of the delta, and with *Port Said*. The Imperial air route serves all the large towns in Egypt and the Anglo-Egyptian Sudan.

Cairo (see p. 223), at the head of the delta, is the capital of Egypt and the largest town in Africa. It has thriving cotton manufactures and, owing to its warm, dry climate, is becoming increasingly popular as a winter resort. *Alexandria* (see p. 223), the port of Egypt, stands at the western end of the delta and has an excellent harbour.

Egypt's principal trade is in cotton and cigarettes. Cotton accounts for about 75 per cent. of the *exports*, cereals and cigarettes being a poor second. Textiles, other manufactures, wood and coal are the principal *imports*. The bulk of the trade (about 50 per cent.) is with Great Britain, followed by the United States and France.

The Suez Canal, which is of vast importance to Egypt and to Britain, has been described in Chapter 20.

Anglo-Egyptian Sudan

The Anglo-Egyptian Sudan (*area*: 1,008,100 sq. miles; *population*: 5,600,000) is situated south of Egypt and east of the Sahara. There is a small stretch of coastline along the Red Sea in the north-east, and Abyssinia forms the south-eastern boundary. The country is administered by a British Governor-General.

The height of the country varies from 1,500 to 3,000 ft. above sea-level, except in the extreme north-east bordering the Red Sea, where a northern spur of the Abyssinian Highlands reaches a height of over 3,000 ft.

The country may be divided into three natural regions. To the north of Berber the land is *desert* except in the immediate vicinity of the Nile, where the date palm is the chief product. Southwards the land passes from scrubland into *savannah*, while south of latitude 5° N. there is a small region of *tropical forest*.

The grasslands are the most important regions, and are used for the rearing of cattle, sheep, goats and camels. Ivory is obtained from the many elephants which live in their wild state in the south, while gum arabic is an important export from the forest zone west of Sennar. Thanks to extensive irrigation works, based on the Nile, and to Government assistance, agriculture is markedly developing, and the building of the great *Sennar Dam* on the Blue Nile to irrigate the *Gezira Plain* has greatly assisted the production of cotton and tobacco, for both of which there is a great future. Millet (the chief food crop), ground-nuts, beans, melons, onions and dates are also grown to a considerable extent.

In clearings in the southern forest region, cotton, coffee, sisal and maize are produced, whilst the forests provide hardwoods and rubber.

As yet there are few roads in Sudan, and communication is by river, rail and animal transport. Part of the northern section of the Cape-to-Cairo railway links Wadi Halfa to Berber and Khartoum. Berber is also connected with *Port Sudan*, the chief port of the country, situated on the Red Sea, and with *Suakin*, also on the Red Sea coast; while Port Sudan is linked with *Makwar* (Sennar Dam) *via* Haifa, Kassala and Gedaref. *Khartoum*, the capital, at the junction of the Blue and White Niles, is an important rail, river, air and caravan centre.

The principal *exports* of the colony are cotton and cotton seed (60 per cent. of the total), gum arabic, sesame, hides and skins, and dates. The principal *imports* are cotton fabrics, machinery, sugar, iron and steel goods, coffee, tea, tobacco, flour, coal, petroleum and soap.

The bulk of the trade (over 50 per cent.) is with Britain.

NORTH-WEST AFRICA

Collectively known as the **Barbary States**, this region comprises **Morocco**, **Algeria**, **Tunisia** and **Tripoli**, stretching along the Mediterranean coast from the western boundary of Egypt on the east to the Atlantic on the west.

The region is built up of a series of mountain ranges running east and west, parallel to the Mediterranean coast, and divided roughly into the *Maritime Atlas* and the *Saharan Atlas*, with the elevated *Plateau of the Shotts* between the ranges. The two ranges tend to combine in Morocco, where they reach their greatest height in the *Great Atlas*, which rises in parts to over 12,000 ft.

The climate is of the Mediterranean type, with winter rains on the coast, and rainfall decreasing inland. The lower coast-lands are covered with evergreen trees and shrubs, but southwards, across the plateau, the region passes into semi-desert and desert. There is a large production of wheat, barley, maize, Mediterranean fruits and wine on the coastal lowlands, irrigation being practised in the regions of low rainfall. The plateau (Meseta) is too dry for crops and is mainly devoted to the rearing of cattle, sheep and goats, whilst the desert areas produce dates.

in the oases. Alfa, or esparto grass, is an important product exported for the making of paper. Minerals include iron, lead, zinc and phosphates. Railways along the coast link up Tunis, Algiers and Oran, while branches run inland to Biskra, Fez and Marakesh.

MOROCCO (*area :* 213,350 sq. miles ; *population :* 5,300,000) is the most westerly of the Barbary States and is divided into the *French Zone*, the *Spanish Zone*, and the neutral *Tangier Zone*. The country rises from a narrow coastal plain to the Atlas Mountains. It experiences a typical Mediterranean climate on the coast, but inland the climate gradually becomes more extreme.

The chief *exports* are wheat, phosphates, barley and eggs. The *imports* include textiles, sugar, petroleum, tea, motor cars, machinery and iron and steel goods. The greater part of the trade is with France, Spain and Britain. *Morocco* is the capital.

ALGERIA (*area :* 847,500 sq. miles ; *population :* 6,500,000) is a French possession situated east of Morocco and rising inland from the coastal plain. The climate is typically Mediterranean, with rainfall decreasing from north to south and from west to east. There are important supplies of minerals, including iron, phosphates and zinc.

Wines are by far the most important *export*, followed by cereals, sheep, olive-oil, phosphate and esparto. The main articles *imported* are cotton goods, motor-cars, sugar, cereals, iron and steel goods, petroleum, coal, coffee and machinery. The greater part of the trade is with France. *Algiers* is the capital.

TUNISIA (*area :* 48,300 sq. miles ; *population :* 2,400,000), another French possession, is situated east of Algeria, of which it is a physical continuation. Except that the rainfall is lower, the climate in other respects is similar to that of Algeria. Agriculture is the predominant industry, but minerals, including phosphates, iron and lead, are plentiful.

The principal *exports* are cereals, minerals, wines, hides, fruits and live animals. *Imports* include foods, textiles (from Britain), and other manufactures. Much of the trade is with France. *Tunis* is the capital.

TRIPOLI, or LIBYA (*area :* 810,000 sq. miles; *population :* 1,000,000), is an Italian possession situated between Tunisia and Egypt. The climate passes from the Mediterranean type on the coast to a desert type in the interior. Dates and alfa grass, together with ostrich feathers brought overland from Central Africa, form the main exports. *Tripoli* is the capital.

WEST AFRICA

Under this heading come the states of ANGOLA, BELGIAN CONGO, FRENCH WEST AFRICA, TOGOLAND, THE CAMEROONS, NIGERIA, DAHOMEY, GOLD COAST, IVORY COAST, LIBERIA, FRENCH GUINEA, SIERRA LEONE, PORTUGUESE GUINEA, GAMBIA and SENEGAL. The SAHARA DESERT has been dealt with in Chapter 9.

Some of this area, *e.g.*, the Cameroons, is over 6,000 ft. high, but the greater part is under 1,500 ft. and there is much land under 600 ft., especially along the Guinea coast. On the lowlands, where throughout the year very heavy rainfall is experienced and the temperature remains around 80° F., there are vast areas of tropical forest. Further inland the altitude modifies the temperature and savannah land predominates.

In most of the States millet and maize are produced in the savannah regions, with rice in the wetter districts, and valuable timber is obtained from the forests, where also wild rubber is tapped.

By reason of its extremely hot, moist climate much of the region is generally unsuited to the white man and is consequently little developed, though with the increasing value of tropical products, white organisation and consequent development are inevitable.

It is possible to distinguish four natural regions (1) The Coastal Belt; (2) The Lower Slopes of the Plateau; (3) The Savannah; (4) The Steppeland.

1. THE COASTAL BELT, comprising the coasts of Guinea and the Congo Basin, has the usual equatorial climate—very hot and very wet—and is consequently clothed with equatorial forests. This region produces mainly palm oil, rubber, tropical fruits, cocoa and mahogany.

2. THE LOWER SLOPES OF THE PLATEAU have monsoon forests and are not very accessible. Mahogany is floated down those rivers which are navigable, and, where railway transport is available (as in the Gold Coast and Nigeria), kola nuts are sent to the coast. Maize is the principal food and cotton is cultivated in some parts.

3. THE SAVANNAH lies south of the Niger Basin and is mainly a cattle-rearing region, but crops such as wheat and rice, the latter with the aid of irrigation, are grown on the banks of the Upper Niger.

4. THE STEPPELAND lies north of the Niger Basin and is much drier than the savannah. It is an area of poor pasture land on which goats, sheep and camels are reared. Millet is the only food crop of importance.

British West Africa

GAMBIA (*area*: 4,134 sq. miles; *population*: 210,000), a colony and protectorate under Britain, consists of a number of small islands in the River Gambia and a narrow strip of territory extending along both banks of the river for a distance of about 250 miles. The climate is hot with a comparatively low rainfall (chiefly in summer) and vegetation is thus of the savannah type, with mangrove swamps along the lower river courses.

The main product and *export* is ground nuts, while the principal *imports* are cotton goods and rice. The bulk of the trade is with France and Britain.

The capital and port is *Bathurst*, and internal communication is maintained by steamers plying on the River Gambia.

SIERRA LEONE (*area:* 31,700 sq. miles; *population:* 1,550,000), a colony and protectorate situated on the Gulf of Guinea between French Guinea and Liberia, extends through undulating land to the edge of the African plateau, and is drained by many rivers. The damp heat makes the country unsuitable for Europeans, hence the name by which it is sometimes known—" the white man's grave."

There is much tropical forest, from which are obtained the principal *exports*, palm oil and palm kernels, as well as kola-nuts and ginger (the dried root of a tropical plant). The *imports* consist mainly of cottons, coal, tobacco, spirits, oil and hardware. The greater part of the trade is with Britain.

Freetown, the capital and chief port, handles nearly all the trade and is an important entrepôt. Communication is largely by railways running from Freetown to Pendembu, and from Boia Junction to Kamabai.

THE GOLD COAST (*area:* 78,802 sq. miles; *population:* 3,000,000), includes Gold Coast Colony, Ashanti and the Northern Territories, situated on the Gulf of Guinea between the French Ivory Coast and French Togoland. The country consists of equatorial forest passing inland to savannah. The low-lying coastal strip is hot, moist and unhealthy, but inland altitude and distance from the sea cause a diminished temperature and rainfall.

The most important products and *exports* are cocoa (nearly half the total world supply), gold, diamonds and manganese. Mahogany, palm oil, palm kernels and copra also are exported. The *imports* consist of cottons, oil, machinery, iron and steel goods, cigarettes and tobacco, silk goods, motor-cars, wheat and rice. The trade is mainly with Britain, followed by the United States, Germany, Holland and France.

Accra, the capital, is the largest town and was the chief port until it was superseded by the new port of *Takoradi*. *Sekondi* is also a port, while *Kumasi* is the chief town in Ashanti. The main railway runs from Takoradi and Sekondi to Kumasi, which is joined by rail to Accra also.

Attached to the Gold Coast for administrative purposes is part of the mandated territory of *Togoland*, a former German Colony. Its chief products are palm-oil, palm kernels, cocoa and kola nuts.

NIGERIA (*area:* 372,674 sq. miles; *population:* 20,000,000) is the most easterly, the largest and the most important of the British West African possessions. Northern Nigeria is part of the African tableland, with the *Lake Chad* depression lying in the extreme north-east. The tableland is drained by the rivers *Niger* and *Benue*, which unite at the edge of the tableland and descend to the coastal plain, whence they enter the sea through a large delta.

Southern Nigeria and the lowlands of Northern Nigeria are hot at all seasons and receive abundant rain. Both rainfall and temperature decrease inland and, despite the low latitude, the climate of the uplands is quite bracing. In the extreme north is a semi-desert area.

The forest regions of *the delta and of the coastal lowlands* produce palm-oil, palm kernels, cocoa, rubber, mahogany and ebony, while at Udi there are important coal mines. Inland is the *savannah* region, producing millet, maize (in wet districts), wheat (in drier districts), rice (in the swamps), and cotton. The Bauchi plateau has large deposits of tin and iron, whilst the *semi-desert* produces ground-nuts.

Of the *exports*, palm-oil and kernels account for more than half the total, others being tin, ground-nuts, cotton, cocoa, hides, skins, mahogany, rubber and ivory. The *imports* consist mainly of cotton goods, hardware and miscellaneous articles. The greater part of the trade is carried on with Britain.

From *Lagos*, the capital and chief port, a railway runs via *Kaduna*, an important inland centre, to *Kano*, the chief town of Northern Nigeria, and *N'Guru*. There are several small branch lines, including that from Zaria to Jos, which serves the Bauchi tin mines. From *Port Harcourt*, an eastern line runs to Kaduna and this also has a branch line to Jos. The Niger and Benue are much used for transport purposes in the interior.

The British part of the mandated territory of the CAMEROONS is attached to Nigeria for administrative purposes.

French West and Equatorial Africa

FRENCH WEST AFRICA (*area*: 1,440,191 sq. miles; *population*: 14,000,000, all but a small fraction being natives) consists of SENEGAL, FRENCH GUINEA, the IVORY COAST, DAHOMEY, FRENCH SUDAN, UPPER VOLTA, MAURITANIA and NIGER, and DAKAR and its dependencies.

All the possessions are largely undeveloped, and the most important commercially is Senegal. The main *exports* are ground-nuts (especially from Senegal), palm kernels, palm oil, hides, skins, bananas, rubber, cotton, cocoa and timber.

The most important towns are *St. Louis*, a port and the capital of Senegal; *Dakar*, the principal port of Senegal and the capital of French West Africa; and *Grand Bassam*, the port of the Ivory Coast.

France holds the mandate for that part of TOGOLAND and the CAMEROONS which is not mandated to Britain.

FRENCH EQUATORIAL AFRICA consists of GABUN, MIDDLE CONGO, CHAD and UBANGI-SHARI COLONIES (*area*: 912,049 sq. miles; *population*: 3,200,000). It extends from the coast south of the Cameroons north-eastwards to the Anglo-Egyptian Sudan and is still undeveloped.

The only notable *export* is ivory. *Libreville*, *Loango* and *Port Gentil* are the ports.

Portuguese Guinea and Angola

PORTUGUESE GUINEA (*area :* 13,944 sq. miles ; *population :* 365,000) south of the Gambia, *exports* rubber, wax, oil-seeds, ivory and hides. *Bissau* is the chief port.

ANGOLA, or PORTUGUESE WEST AFRICA (*area :* 476,600 sq. miles ; *population :* 2,600,000), situated north of South-West Africa, *exports* coffee, maize, diamonds, sugar and coconuts.

The chief ports are *Benguela* and *Loanda*. Lobito Bay, near Benguela, is the western terminus of the east-west " transcontinental " line. The capital is *New Lisbon*.

Spanish West Africa

The Spanish possessions in West Africa include RIO DE ORO and IFNI in the north-west ; SPANISH GUINEA almost on the Equator, and the islands of FERNANDO PO, ANNOBON, CORISCO, GREAT ELOBEY, and LITTLE ELOBEY.

They are commercially unimportant, but Fernando Po—considered one of the most fertile parts of West Africa—exports cocoa.

Liberia

The native Republic of Liberia (*area :* 43,000 sq. miles ; *population :* 1,000,000) is situated between Sierra Leone and the Ivory Coast. The climate is hot and wet in the south, where there are dense equatorial forests, while in the drier north there are savannahs.

There is considerable natural wealth, but it is almost wholly undeveloped, the only *exports* of note being palm-oil and palm-kernels, which mainly pass through *Monrovia*, the capital and chief port.

Belgian Congo

The Belgian Congo (*area :* 918,000 sq. miles ; *population :* 9,400,000), situated in Central Africa, comprises the vast area or basin drained by the Congo River (see p. 518) and its tributaries. It is largely an equatorial rain-forest region, stretching approximately from lat. 5° N. to lat. 10° S., but the higher parts are covered with grass. The forests, largely inaccessible, are inhabited by negrillos (see Chapter 17).

The forest products include palm-nuts, palm-oil, copal, rubber and ivory from elephant tusks. There are also plantations of coffee, cocoa, rubber and oil-palm in the clearings, while rice and cotton are widely cultivated in native villages. Minerals are important, particularly copper (in the Katanga area), gold, diamonds and tin.

The principal *exports* are gold, diamonds, copper, palm-nuts, palm-oil, cotton, ivory and copal. The main *imports* are machinery, provisions, cottons, alcoholic drinks and mineral oils. The greater part of the overseas trade is with Belgium.

Inland transport in the Belgian Congo is mainly by river, but there are also over 2,800 miles of railway, 24,000 miles of road, and an air route mileage of nearly 3,000 miles. The importance of river traffic is such that a pipe line, 246 miles long, conveys crude oil from Matadi to Leopoldville at the head of Stanley Pool for the use of river steamers.

Boma, Banana, Matadi and *Leopoldville* are the ports on or near the mouth of the Congo, whilst inland, near the Stanley Falls and almost on the Equator, is *Stanleyville*, a river port. *Elizabethville*, in the extreme south, on the Cape-to-Cairo Railway, is the important town of the Katanga district.

AFRICAN ISLANDS.

British African Islands

The British Islands include ASCENSION and ST. HELENA, lying about 1,000 miles out in the Atlantic and chiefly important as cable, coaling and wireless stations ; TRISTAN DA CUNHA, an inhospitable island midway between the Cape of Good Hope and South America ; MAURITIUS, a volcanic island in the Indian Ocean, exporting sugar ; RODRIGUEZ and the CHAGOS ARCHIPELAGO, also in the Indian Ocean, dependencies of Mauritius ; and the SEYCHELLES ARCHIPELAGO, situated 1,000 miles east of Mombasa. *Mahé*, the chief island of the Seychelles, exports copra and coconut oil from *Victoria*, the capital of the Archipelago.

Spanish Islands

THE CANARY ISLANDS, situated off the north-west coast of Africa, constitute a province of Spain. They export bananas, and, in addition to being an important calling place and coaling station for steamers, are well known as winter resorts, by reason of their wonderfully fine climate. The chief ports are *Santa Cruz de Teneriffe* and *Las Palmas*.

Portuguese Islands

THE CAPE VERDE ISLANDS, south of the Canaries, are a Portuguese possession in which *St. Vincent*, the capital and chief port, is an important coaling station supplying coal to ships proceeding to South America.

MADEIRA, north of the Canaries off the Moroccan coast, is politically part of the Portuguese mainland. It is used largely as a tourist and health resort because of its warm and sunny winter and exports wine, pineapples and bananas, early vegetables and fancy goods. *Funchal* is the capital, chief port and commercial centre.

PRINCIPÉ and SÃO THOMÉ, Portuguese islands in the Bight of Biafra, export cocoa.

Madagascar (French)

The largest of the African islands is Madagascar, a French possession situated off the south-east coast (see page 522). It exports coffee, canned meats, rafia fibre, manioc, vanilla, sugar and hides, but, though many times larger than England, its foreign trade is very small.

Antananarivo, an inland town, is the capital and is connected by the only railway on the island with *Tamatave*, the principal port.

QUESTIONS ON CHAPTER 27

1. Mention the chief mineral resources in the Union of South Africa, and tabulate the regions where they are found. (*C.I.I. Associateship, Accident Branch*, 1932)
2. Describe the physical features, climatic conditions and natural products of the Transvaal. (*C.I.I. Associateship, Accident Branch*, 1932)
3. *Either* Discuss fully the geographical factors which for long hindered the opening up of Africa
   Or Draw a sketch-map to show the present main lines of communication in Africa. (*I. of B., Pt. I*, 1931)
4. Describe shortly the main physical features of Africa, showing their relation to the climate of the continent. (*R.S.A., Stage I*, 1931)
5. Give a list of British Possessions (but not including Mandated Territories) in Africa with the more important towns of each. (*C.I.I. Associateship, Accident Branch*, 1928)
6. Describe Egypt (not including the Egyptian Sudan), and state how its productiveness has been greatly increased since British intervention in the eighties of last century. (*I. of B., Pt. I*, 1929)
7. Describe the chief railway systems in the Union of South Africa. (*S.A.A. Prelim., May*, 1931)
8. Give a short account of Rhodesia *or* of Kenya Colony. (*L.A.A. Prelim., June*, 1931)
9. Contrast the relief and human activities of the Nile Delta with those of the area centring upon *either* Cape Town *or* Durban. (*L.M., June*, 1925)
10. Write notes on the following :—(*a*) The Great Karroo, (*b*) Hottentots, (*c*) Kaffirs, (*d*) the mineral resources of Natal. (*L.A.A. Prelim., June*, 1931)
11. What do you know of the products of (*a*) Mauritius, (*b*) The Transvaal, (*c*) Bechuanaland ? (*L.A.A. Prelim., Dec.*, 1929)
12. Give an account of the physical features and the commercial products of Natal *or* Cape Colony. (*L.A.A. Prelim., June*, 1929)
13. Describe a journey up the river Nile, noting the changes in the physical features and vegetation, and the value of the river to the lands through which it flows. (*C.I.S. Prelim., June*, 1930)
14. What do you know of the climate and products of Kenya Colony ? How does it differ in these respects from the Belgian Congo ? (*C.I.S. Prelim., Dec.*, 1930)
15. In what various ways do white men earn their living in British South Africa ? What is the importance of the native and other coloured peoples in that area ? (*L.M., Jan.*, 1923)
16. Into what climatic regions would you divide the coastal belt of West Africa ? Give the characteristic products of three of the regions you mention. Give also the principal ports for exporting the surplus products. Draw a sketch-map to illustrate your answer. (*L.M., Jan.*, 1930)
17. From what parts of Africa does Great Britain obtain supplies of raw cotton, cacao, wool, palm oil ? Give a short account of the conditions suitable for the production of each commodity, and in each case the probable port of export. (*C.S., Dec.*, 1929)
18. Describe briefly the physical features of the African tableland south of the Equator. Point out any difficulties of communication between the coast and the interior which are due to the structure and relief. (*O.L.*, 1919)
19. Give an account of the resources and development of *two* of the following countries: Nigeria, Gold Coast, Belgian Congo, French Morocco, Sudan. (*C.I.S. Prelim., June*, 1934)

CHAPTER 28

OCEANIA

OCEANIA comprises the COMMONWEALTH OF AUSTRALIA, the DOMINION OF NEW ZEALAND, and the PACIFIC ISLANDS. The Islands are divided into the POLYNESIAN, the MELANESIAN and the MICRONESIAN groups.

AUSTRALIA, the smallest of the five continents, is situated to the south-east of Asia. The continent was at one time connected with the East Indian Archipelago but is now separated therefrom by the *Torres Strait*. To the south-east lies the island of TASMANIA, separated from the continent by the *Bass Strait*. Over one thousand miles to the south-east of Australia, across the *Tasman Sea*, lie the islands of NEW ZEALAND.

THE MELANESIAN ISLANDS (or Melanesia) lie off the north-east of Australia, being separated from it by the *Coral Sea*, while to the north of Melanesia are the MICRONESIAN ISLANDS, which consist of a number of very small islands scattered over a wide area. THE POLYNESIAN ISLANDS (or Polynesia) lie in a semi-circle to the south-east and north-east of these two groups and extend from the FIJI ISLANDS, north of New Zealand, to the HAWAIIAN ISLANDS, which lie in the centre of the north Pacific Ocean, almost midway between California and Japan.

AUSTRALIA

Area : 2,974,581 sq. miles ; *Population :* 6,600,000

Australia consists of six semi-independent States—NEW SOUTH WALES, VICTORIA, QUEENSLAND, SOUTH AUSTRALIA, WESTERN AUSTRALIA and the island of TASMANIA—together with NORTHERN TERRITORY (embracing the two former states of NORTH AUSTRALIA and CENTRAL AUSTRALIA) which is controlled by an administrator appointed by the Commonwealth Government, and FEDERAL TERRITORY, a small inland area in the south-east of New South Wales, in which is situated *Canberra*, the capital of the Commonwealth.

Relief

Australia is compact in shape and has a relatively smooth and short coastline. The three main physical divisions are (1) the Western Plateau ; (2) the East Central Plains, and (3) the Eastern Highlands.

The Western Plateau covers 54 per cent. of the land and, excluding the coastal plain, includes Western Australia, most of North and Central Australia, and the western half of South Australia. The plateau slopes gently to the east, but ends abruptly in the west to form the steep escarpment of the *Darling Range*. Most of the area is between 1,000 and 1,500 ft. above sea-level. In the east the *Musgrave Range* and the *Macdonnell Range* rise to over 3,000 ft. and across the centre is a belt of land, between 2,000 and 3,000 ft. in height, which separates the *Great Victoria Desert* in the south from the *Great Sandy Desert* in the north.

The plateau slopes gradually to the coast in the south and the north, leaving broad plains around the Great Australian Bight in the south and in Arnhem Land in the north. The rainfall of this region being negligible and the soil sandy, there are no rivers of importance, the *Swan* in the south-west being the only stream to reach the coast with any degree of regularity.

The East Central Plains lie between the plateau in the west, the mountains of the east, the shallow Gulf of Carpentaria in the north and Encounter Bay in the south. This vast area, which lies entirely below 600 ft. and falls in parts below sea-level, is almost surrounded by higher land, with the result that there is a huge area of inland drainage around *Lake Eyre* in the north-east part of South Australia.

The latter area is separated from the plains of the *Murray-Darling* basin by a low line of hills known as the *Grey Range*, the *Barrier Range* and the *Flinders Range*. The Eyre district and the surrounding lakes have such an uncertain water supply that at times the lakes dry up completely, leaving vast salt deposits.

The Murray-Darling basin is made up of the valleys of the Murray and the Darling, Australia's largest rivers. The *Murray*, rising in the Australian Alps very near the south-east coast, takes a north-westerly course until it is joined by the *Murrumbidgee* and other tributaries on its right bank. Turning eastwards it is later joined by the *Darling*, which has flowed in a south-westerly direction from the Great Dividing Range. The combined streams then pursue a winding course until they reach the sea at Encounter Bay in the south-east of South Australia. These rivers are very uncertain in volume; sometimes they form a mighty, rushing torrent, whilst at others they cease to flow, and their course is marked merely by a series of water-holes.

In spite of its relative dryness, practically the whole of this region is underlain by vast stores of water, the largest of the artesian basins of Australia extending from the Gulf of Carpentaria through eastern Queensland into South Australia and New South Wales. Further, in the area between the rivers Darling and Murray in the south-east, the rivers are very useful for irrigation purposes.

The Eastern Mountains extend from Cape York in the north to South Cape in the extreme south of Tasmania, being broken only by the shallow Bass Strait. At one time the mountains were composed of great ranges of mountains formed by the folding of the earth's crust, but exposure to the action of the weather during countless ages has caused the peaks to become worn down to mere blunt stumps. The great levelling process has converted the region into a kind of plateau which falls steeply to a narrow coastal plain on the east and slopes gently to the plains on the west.

From the coastal plain the edge of the highlands has the appearance of a great range of mountains and this led to its being given the name of the *Great Dividing Range* by the early colonists, who found it an obstacle cutting them off from the interior. Nowadays, however, the Dividing Range offers no hindrance to communication, for the transverse valleys made by rivers such as the *Hunter* (behind Newcastle), the *Brisbane*, the *Fitzroy* (behind Rockhampton) and the *Burdekin* (near Townsville), provide natural routes to the interior which have been utilised by the railways. The rivers themselves are useless for navigation, being short, swift-flowing and impeded by rapids, falls and sand bars.

Viewing them southwards from Brisbane, the sections into which the range is divided by the river valleys are known as the *New England Range*, the *Liverpool Range*, the *Blue Mountains* and the *Australian Alps*. The last-named contain Mount Kosciusko (7,300 ft.), the highest peak of the whole range. The highlands are joined in the north to the western plateau by the low Selwyn Range, whilst north of this range are the Northern Lowlands around the *Gulf of Carpentaria.*

Coastline

Where the Australian mountains approach the sea, as on the east, there are many fine harbours, and in the south-east the drowning of the coast has provided deep inlets such as *Spencer's Gulf*. On the south-west, the west and the north, the coasts are low and there are large bights with shallow water. In the north is the *Gulf of Carpentaria*, enclosed by *Arnhem Land* and *Cape York Peninsula*, and in the south the *Great Australian Bight*, with *Eyre's Peninsula*, *Spencer's Gulf*, *Yorke Peninsula*, the *Gulf of St. Vincent* and *Encounter Bay* to the east of it.

A notable feature of the north-east coast is the *Great Barrier Reef*, a coral formation stretching for about 1,200 miles, which encloses the coast, presenting few safe openings for ships, and forming a channel varying in width from 150 miles in the south to 20 miles in the north.

Climate

Sea influences are not felt in Australia far from the coastal margins because of the area of the continent, its compact shape and the fact that the high land which borders the coast, especially in the east, shuts off the interior from rain-bearing winds. Further, much of the continent, which is almost bisected by the Tropic of Capricorn, lies in one of the driest zones of the earth. Consequently, Australia on the whole is the most arid of the continents, and nowhere does the temperature fall very low, the northern districts in the Tropics naturally having high mean temperatures and little variation between summer and winter.

Temperature. As no part of the Australian continent lies in high enough latitudes to be cold in winter, snow is almost unknown in the lowlands at that season and it falls in the highlands only in the south-east. The temperature in winter may, however, fall below freezing-point at night everywhere south of the Tropic, and even in summer the desert nights are cold, since the clear, dry air assists radiation from the earth's surface by night just as readily as it allows the sun's rays to penetrate it by day.

Except in Tasmania, the average summer temperature everywhere is high. In mid-summer (January) only the south-west and the south-east coasts experience a temperature lower than 70°F., whilst over the greater part of the continent the average is over 80°F. Exceedingly high temperatures are experienced throughout the interior in the neighbourhood of the Tropic owing to the cloudless sky and dry air, and even on the south coast intense heat is sometimes recorded.

Rainfall. The most important meteorological feature of Australia is that the continent lies in the permanent tropical high-pressure belt which encircles the globe between approximately lats. 20-40°S. From this belt, winds blow outwards and are deflected to the left as the South-

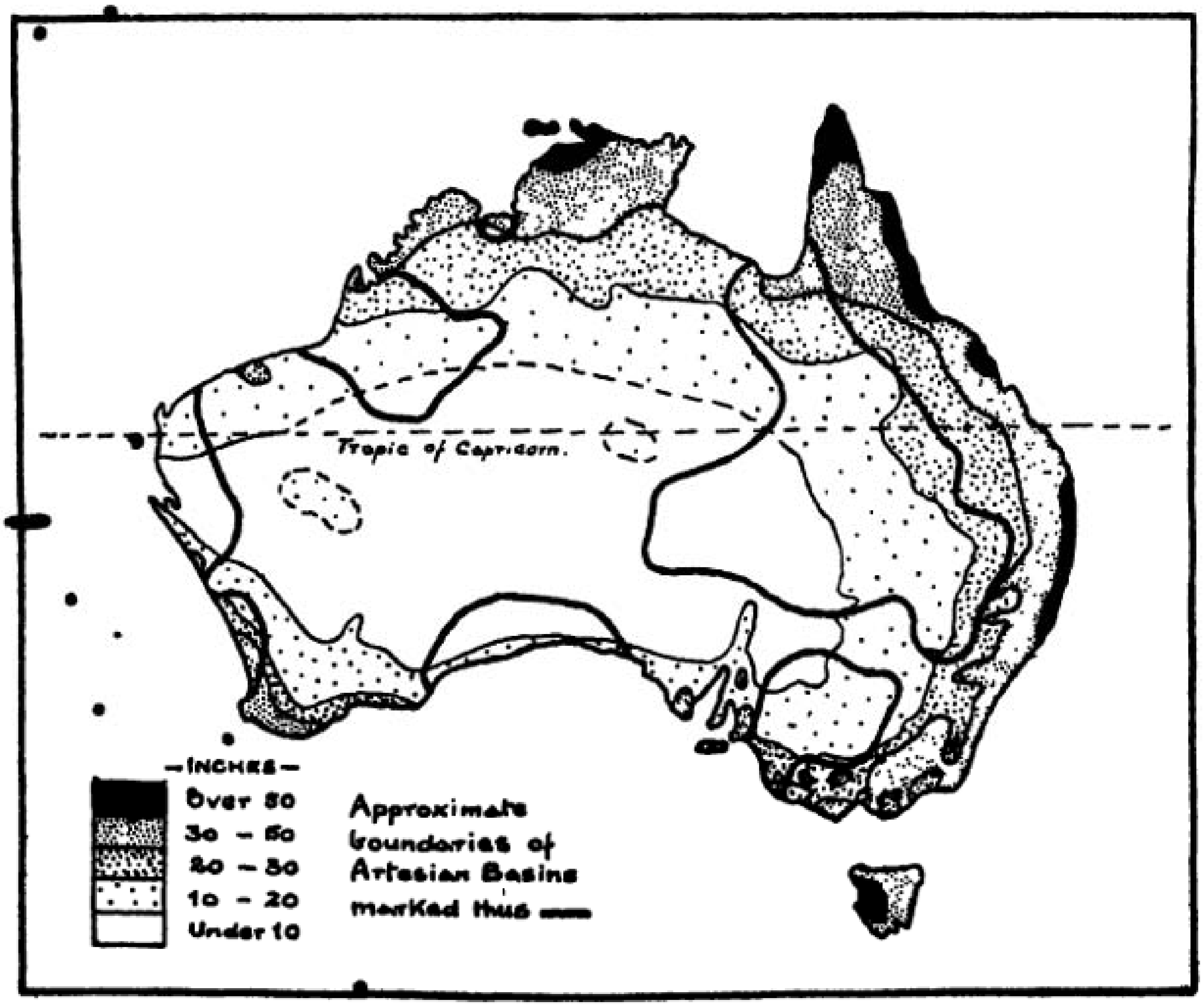


Fig. 184: Mean Annual Rainfall of Australia.

East Trades on the equatorward side of the belt and as the Westerlies or N.W. Anti-Trades on the poleward side.

During the southern winter, when the sun has reached its most northerly latitude, the centre of high pressure is situated in the neighbourhood of the Lake Eyre depression and the South-East Trades thus prevail north of the Tropic. This is therefore the dry season in the northern part of the continent as the winds are blowing off-shore. On the polar side of the high pressure belt, the N.W. Anti-Trades blow from the north-west, bringing winter rain to the south-west corner of Western Australia and to the district on either side of Spencer Gulf and the Gulf of St. Vincent. The whole of Tasmania receives winter rains from these winds.

In the southern summer, the continent is much more heated and the pressure is therefore everywhere lower. The high pressure belt, which now lies to the south-west and south of the continent owing to the southward migration of the sun, is not so marked. At this season, therefore, the Westerlies lie well to the south and, but for Victoria, the most southerly part of the continent, Australia rarely comes under their influence. Even in Victoria, the rainfall is much less than in winter. Tasmania, however, receives rain from the Westerlies in summer and so has rain all the year round. In the east, the South-East Trade winds, forced to rise by the Eastern Highlands, bring a fairly heavy rainfall to the east coast, whilst west of the highlands the precipitation is low. The north of Australia in the southern summer is under the influence of the North-West Monsoon, for the north of the continent becomes heated and causes low pressure conditions to develop, and as the monsoon comes over warm seas, it brings a heavy summer rainfall to the north coast.

Natural Regions

As a result of the considerations dealt with above, Australia can be divided into seven broad climatic and vegetation regions: (1) the Tropical Forest; (2) the Tropical Grasslands and Savannahs; (3) the East Coast; (4) the Temperate Grasslands; (5) the Mediterranean Regions; (6) the Arid Interior, and (7) Tasmania.

THE TROPICAL FOREST REGION of the north and north-east has high temperatures and abundant rain brought chiefly by the summer monsoon. As a result of the great heat and moisture, this region is clothed with tropical forests containing palms, bamboos, bananas and valuable hardwoods, while the cultivated areas produce rice, sugar-cane, coffee, spices and some cotton. As this area, though unsuited to white settlement, is capable of considerable development, it is a pity that Australia insists so strongly on the exclusion of Asiatic labour.

TROPICAL GRASSLANDS AND SAVANNAHS extend south from the tropical forests in the north and on the inner side of the Eastern Highlands in Queensland. The rainfall decreases westwards and the region gradually passes into semi-desert towards the south and west. In the south-east it merges into the temperate grasslands. This region is suitable for cattle rearing and is becoming an important producer of beef.

The East Coast Region lies south of the Tropic and north of Victoria and includes the eastward slopes of the highlands. The climate is of the warm temperate type with the greatest rainfall in the summer.

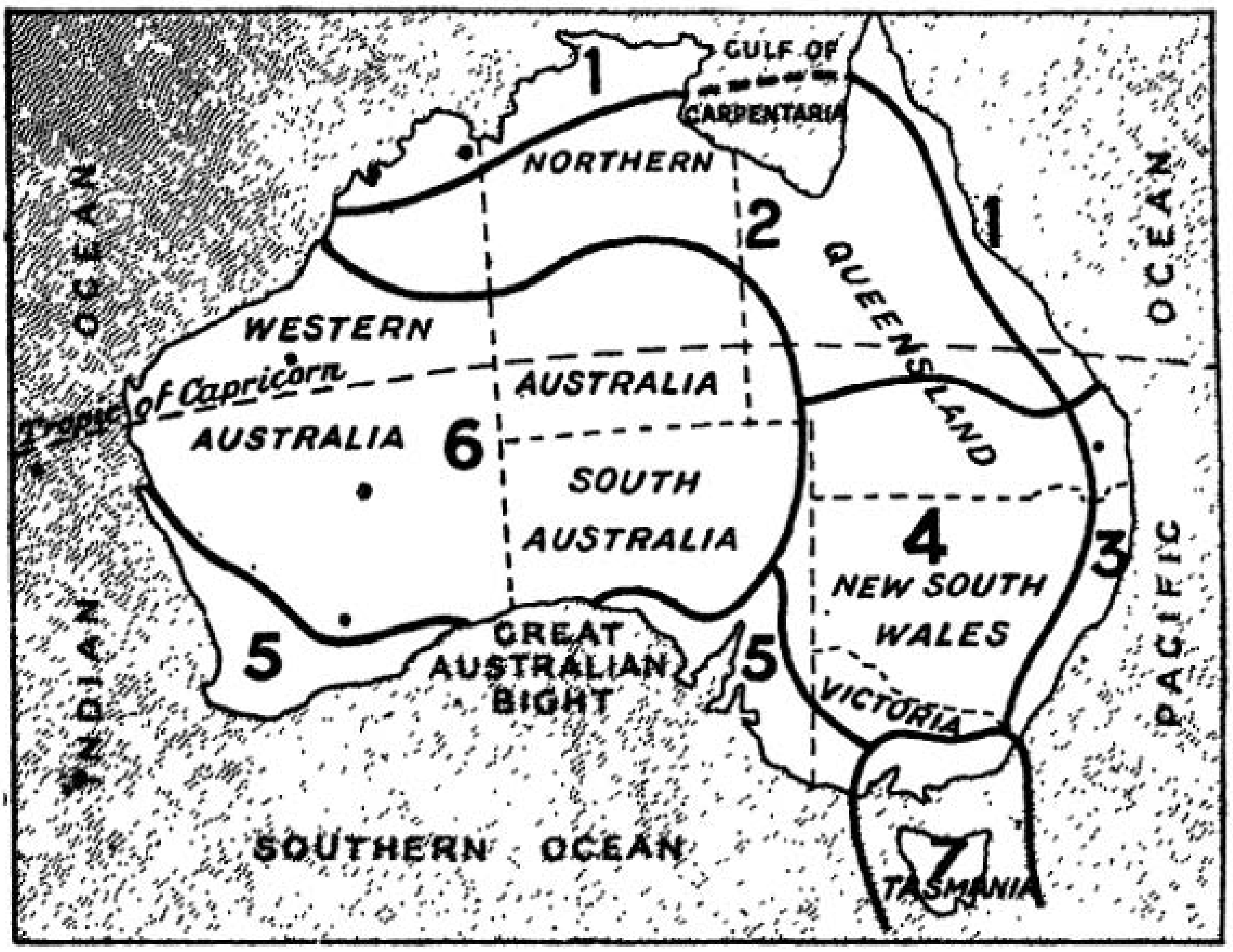


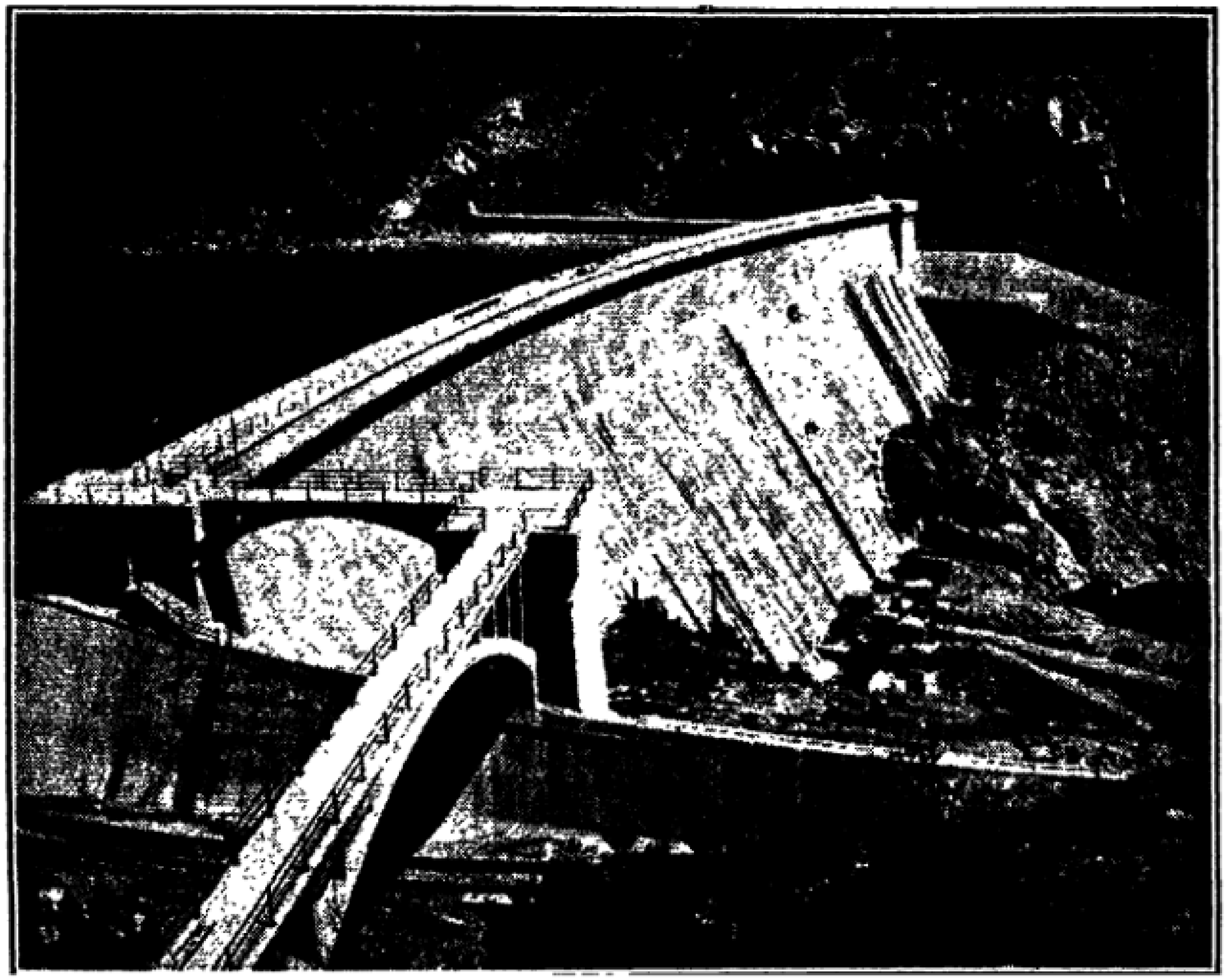
Fig. 184a. Natural Regions of Australia.

Large areas are covered with sub-tropical and temperate forests, and these contain the valuable eucalyptus tree, useful for its medicinal properties.

This region also embraces vast areas of excellent pasture land, so that cattle rearing, sheep rearing and dairying are important. Maize is the chief cereal and fruits (apples and oranges) are grown, while northern areas have conditions suitable for the production of tea, cotton and silk. There is also considerable mineral wealth in this region.

The Temperate Grasslands comprise most of the Murray-Darling basin including the *Riverina*, Australia's great pastoral and agricultural region between the Murray and the Murrumbidgee. The rainfall is too scanty for forest growth and the prolonged droughts render irrigation necessary for both arable and pastoral farming. Nevertheless, this area is very important for the production of both wool and wheat, while Mediterranean and deciduous fruits are grown in the irrigated areas and in several districts dairying is important. The Burrinjuck Dam project on the Murrumbidgee between two hills known as Black Andrew and Barren Jack has brought thousands of acres of sheep pasture under crops.

THE MEDITERRANEAN REGIONS, with winter rains and hot, dry summers, are situated in the south-west part of Western Australia and around Spencer's Gulf. The wetter and higher lands have forests of jarrah, karri and tuart wood, whilst the lowlands produce cereals (especially wheat), and fruits such as olives and grapes.



[By courtesy of the Publicity Dept. of the Commonwealth of Australia.

THE BURRINJUCK DAM, MURRUMBIDGEE IRRIGATION AREA, N.S.W.

By closing up the valley with this huge concrete dam, a vast artificial lake has been formed to furnish water for thousands of acres of fertile but thirsty soil.

THE ARID INTERIOR lies south of the savannahs and west of the grasslands and includes almost one-third of the whole country. It is almost entirely desert, with no streams which flow throughout the year, and with only a scant vegetation of thorny shrubs and sparse, tough grass in patches. In the west, settlements have been established round the Coolgardie and Murchison gold-fields, but water has to be conveyed for miles in order to make human life possible in this extremely barren area. Round the margins of the desert sheep are reared.

THE TASMANIAN REGION, comprising Tasmania and the extreme south of Victoria, has a cool temperate climate, with rainfall throughout the year. Much of the region is well-wooded, while fruit-farming (apples) as well as sheep and cattle rearing are important.

Communications

As the rivers of Australia are useless for transport purposes, the importance of an efficient railway system cannot be exaggerated. As the interior of Australia is so inhospitable, however, and as the eastern coastal districts have the bulk of the population, the railways do not radiate from a central point (as they do in Spain, for example), but are confined mainly to the south-eastern coast, where they follow the coastal plain to connect up the different ports and run for some distance inland, from the coast to the mining and agricultural centres. Nevertheless, the most highly developed areas—New South Wales, Victoria and the south-east of South Australia—have quite a comprehensive network of lines, while there is a similar though smaller system in the south-west of Western Australia.

These two main networks, *i.e.*, that of the south-east and that of Western Australia, are joined by the Trans-Australian Line which crosses the south of the continent just north of the Great Australian Bight, from Port Augusta on Spencer's Gulf in South Australia to Fremantle, the port of Perth on the Swan River in Western Australia. This route is highly important as a link between the east and west of the continent.

Port Augusta is also the southern starting point of the line which is intended to link up north and south Australia. At present the line is in two sections; one runs northwards from Port Augusta to Strangway Springs, Oodnadatta and Alice Springs at the foot of the MacDonnell Range in Central Australia. The other section starts at Darwin, on Clarence Strait, in North Australia, and runs southwards *via* Pine Creek for about 300 miles (see Fig. 145 in Chap. 18).

The Eastern Highlands, though a considerable barrier to early settlers, are a source of little difficulty to railway engineers, and advantage is taken of the numerous gaps to bring agricultural and mineral products to the sea. The principal difficulty in Australian railway development is that the different states of Australia use different gauges for their lines, whilst even in the same state the gauges are not always consistent. This, of course, necessitates breaking bulk in long distance traffic, but steps are being taken to remedy this defect and in time Australia should have a very satisfactory railway system. Air routes, too, are developing, and have already proved a great boon to the widely scattered centres of Western Australia, North Australia and western Queensland (see Chapter 19).

Agriculture

Arable farming is an important industry in Australia but, as yet, it takes second place to the pastoral industry. The area under crops is increasing, however, and every opportunity is taken to improve the produce in both quantity and quality. Although the scarcity of rainfall in some parts and the uncertainty of rainfall in others have proved a serious obstacle to crop growing, the development of irrigation by means of dam construction and the boring of artesian wells, combined with the adoption of dry farming methods, are rapidly bringing more land under cultivation. Even so, the total area under crops is only 1·1 per cent. of the total area of the Commonwealth, and of this area wheat occupies over 70 per cent. and hay nearly 13 per cent.

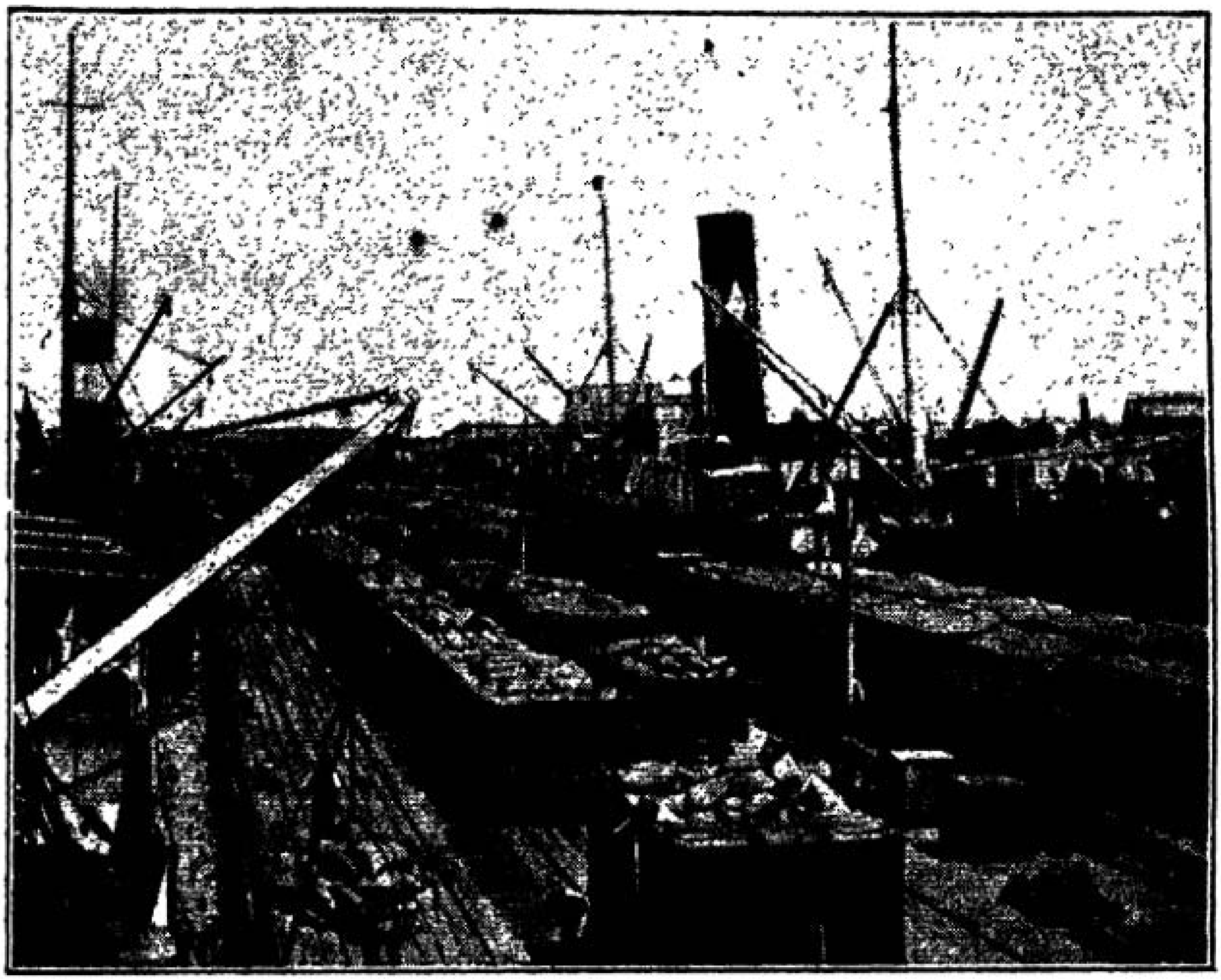
WHEAT. New South Wales, Victoria, South Australia and Western Australia are the wheat producing states, each having between 3–4 million acres under the crop. The great wheat belts are found in the temperate grassland area on the inner side of the Eastern Highlands, where sheep rearing and wheat farming are carried on side by side, and in the Mediterranean regions of the south and south-west. These regions, it will be observed, lie beyond the Tropics and roughly in those areas experiencing between 10–30 inches of rainfall, the greatest production being between the isohyets of 20 and 30 inches.

In the east, irrigation and dry farming have effected a great increase in the area which can profitably be sown with wheat. The irrigated regions of the lower Murray (round Wentworth, Mildura and Renmark), of the Riverina (N.S.W.) and of Wimmera (Victoria)—the richest wheat land in the Commonwealth—are extremely productive.

In the Mediterranean regions, the dry, hot summers are eminently suitable for ripening the grain, and the production in the south-west of Western Australia, particularly, has rapidly increased of late years.

Although the yield per acre of Australian wheat is low, it is gradually being increased (mainly as a result of improved methods of cultivation), and the cereal at present constitutes the second most important export of the Commonwealth. The wheat has the advantage of being of good quality and frequently fetches high prices. The exports are sent mainly to the United Kingdom and India, whilst Italy, Japan, Egypt, South Africa and France also import considerable quantities. The relative nearness of the wheat-producing areas to the sea is a distinct advantage to the export trade, for compared with the inland situation of other great wheat-exporting regions, such as Canada, the cost of transporting the wheat to tidal water is low.

An interesting feature of the Australian wheat industry is the "complete harvester", a machine which performs all the operations of harvesting, from cutting to the bagging of the grain. This is in great contrast to the methods adopted on the prairies of North America, where the grain is bulk-handled, *i.e.*, sacks are not employed, the wheat being transported and shipped loose in bulk. This system of bulk-handling has, however, been adopted experimentally in Western Australia, and it is probable that its use will spread and become a permanent feature.



[By courtesy of the Publicity Dept. of the Commonwealth of Australia.

LOADING WHEAT AT MELBOURNE.

The Australian method of handling wheat in sacks is in distinct contrast to the system of bulk handling used in Canada and the United States as illustrated on page 596.

HAY is grown over large areas throughout the Commonwealth as a food for sheep, cattle and horses. The hay is not composed of meadow grasses, as is most usual in other countries, but consists mainly of wheat and oat straw. The yield varies considerably, due largely to the variations in the relative prices of grain and hay and to the favourableness or otherwise of the season for a grain crop. If, in any season, hay increases in price or the outlook for grain is unsatisfactory, crops originally sown for grain are cut for hay; on the other hand, crops intended for hay are left for grain if the prices for grain improve or there is a prospect of a heavy yield. Victoria has the greatest area thus devoted to hay.

Considerable quantities of lucerne hay also are produced, especially in the flood plains of the rivers in Queensland and New South Wales.

OATS are grown on about 5 per cent. of the total area under crops in Australia. The crop—used chiefly as food for cattle—is grown mainly in Victoria, but Western Australia, New South Wales and South Australia also are producers.

Maize. Queensland and New South Wales are the only States growing maize at all extensively for grain. The cereal is cultivated in the hotter and wetter valleys of northern New South Wales and southern Queensland, but the area under cultivation has decreased of late years. At present, the crop is used chiefly as a green forage, especially in connection with the dairying industry.

Barley and **Potatoes** are grown in different parts of Australia but the total acreage is small. South Australia has the greatest area under barley, followed by Victoria, whilst Victoria and Tasmania are the leading potato-growing states.

Sugar-Cane. In spite of difficulties in connection with labour supply, the area under sugar-cane in Australia has gradually increased, and is now over 300,000 acres. Thanks to Government assistance in the form of an embargo on sugar imports, and to the higher yield of sugar obtained as a result of scientific research, the industry has become one of great national importance. The leading producing area is the coastal district of tropical Queensland, whilst there is a small acreage (about 8,000 acres), yielding sugar-cane in northern New South Wales.

The industry employs no coloured labour, a remarkable fact in cane production and a great drawback to its full economic development in the country. Nevertheless, the total output of raw sugar is more than sufficient for local requirements, and nearly 40 per cent. of the total output was exported in 1932.

Sugar Beet is grown in Victoria, but only to a small extent. The sugar content is exceptionally high, but the total quantity of raw sugar produced is relatively small.

Grapes. The vine flourishes in the Mediterranean regions of South Australia and Victoria, whilst New South Wales, Western Australia and Queensland are smaller producers. There is room for considerable development in the winter rain region of Western Australia.

The grapes are grown for wine making, for table use and for drying, but of these, the first is the most important. The Commonwealth has in recent years developed a considerable and growing wine industry and for some time past has carried on a steady export trade, particularly with Great Britain, in wines of the Burgundy type.

The quality of Australian wines is excellent, and they will probably some day form a large percentage of the wines consumed in the United Kingdom. South Australia is by far the most important producer, accounting for about 80 per cent. of the total wine output of the Commonwealth.

The *brandy* industry has developed and the output is now sufficient for local needs, but there is no export.

Table grapes are produced only for home consumption, but the preparation of *raisins* and *currants* has assumed greater importance and provides a growing export.

OTHER FRUITS. The output of other fruits in Australia is now very large and is extending, varying from fruits such as the pineapple in the Tropics to the cool, temperate fruits, such as the strawberry and raspberry. Victoria grows mainly apples, peaches, pears, oranges, plums and apricots ; in New South Wales citrus fruits such as oranges and lemons are the leading fruits, but others such as apples, peaches, plums, cherries, pears and bananas also are widely grown ; Queensland produces bananas, coconuts, pineapples, oranges, peaches, apples and plums ; South Australia grows almonds, olives, oranges, apples, apricots, plums, pears and peaches; whilst Western Australia is noted for its production of apples, oranges, pears, plums, peaches, apricots and figs. In Tasmania, 80 per cent. of the fruit growing area is devoted to the production of apples.

The cold storage facilities provided by modern railways and liners have led to the establishment of a great export trade in fresh fruit from Australia, whilst the success of the sugar industry has stimulated the production and export of preserved fruits. The fresh fruit export consists largely of apples, and an important point in connection therewith is that the fruits reach the European markets at a time when the home stock of such fruits is low.

COTTON. The soil and climate of the tropical regions of Queensland are eminently suited to cotton cultivation and a Government bounty has been given to stimulate the industry. The output is small, however, and will continue to remain so until the policy of restricting coloured labour is reversed—an unlikely event even in the remote future.

Pastoral Industry

SHEEP AND WOOL. The number of sheep in the Commonwealth not only far exceeds that of any other animal, but constitutes the second largest of any in the world. The sheep, numbering over 100 millions, are reared primarily for their wool, Australia being easily the most important wool-producing and wool-exporting country in the world.

This great industry is a result of the character of the country, the suitable climate (which keeps the sheep singularly free from disease and renders winter housing unnecessary), and the skill and enterprise of the sheep breeders. The industry has been greatly assisted by irrigation and railway development, which have made it less precarious and opened up new areas. The greatest number of sheep are found in those areas which receive between 15–30 ins. of rainfall per year, but the drier and even the "salt bush" areas, where the rainfall is considerably less, are now becoming useful with the aid of irrigation. The rabbit pest, so long the bane of Australian farmers, is at last being overcome by the use of rabbit-fencing, and rabbit skins are even providing an export.

New South Wales is the chief sheep rearing state, for it possesses ideal pastures in the rolling temperate grasslands which cover such a large portion of its area. Here, and throughout the country generally, the merino sheep, which thrives best in a dry climate, predominates in the interior, while the heavier crossbreed, reared chiefly for its meat, is kept in the largest numbers on the wetter coastal lands. The other States, in order of importance as wool producers, are Victoria, Queensland, South Australia and Western Australia, although Queensland has a larger number of sheep than Victoria. Tasmania also produces wool.

Australian wool represents about 25 per cent. of the total world output, and its importance is increased still further by its fine quality; actually the output represents one-half of the world's production of fine quality merino wool. Further, over 90 per cent. of the clip is exported, and wool is not only the outstanding feature of the Australian pastoral industry, but is also the basis of the nation's economic life—a good clip and satisfactory prices mean prosperity, whilst a bad clip and low prices lead to economic distress. By far the greater part of the wool is shipped "in the grease" (*i.e.*, uncleansed), the United Kingdom and France being the leading customers, with Japan, Germany, Belgium, the United States and Italy following. About one-sixth of the wool exported is cleansed before export and of this quantity the United Kingdom takes about 50 per cent.

The production of mutton and lamb, although considerable, is much less important than the wool industry and, unlike that industry, the greater part of the meat production, amounting to about 85 per cent., is consumed locally. The exports of mutton and lamb have not increased since 1913 owing to the depressed state of the world's meat markets. This is one of the few instances where the development of refrigeration has not resulted in a sustained and increasing production for export, although expansion may probably be looked for in the near future.

Other by-products of the sheep industry are skins and tallow, both of which are exported.

CATTLE in Australia number over 12 millions, of which over 5 millions are found in Queensland on the tropical grasslands and savannahs which stretch westwards into Northern and Western Australia. These tropical lands provide the best quality beef cattle. Where rainfall is deficient, irrigation by means of artesian wells is employed. It has brought vast areas under pasture. The cattle farms are of enormous size, some being as much as 5,000 sq. miles in extent.

Each year the cattle are rounded up and taken to the yards for the branding of the young stock and the drafting of the "fats" into paddocks before they are sent to the slaughtering and packing centres in the markets of Brisbane and Adelaide. Frequently the cattle have to travel to the railways on foot at the rate of about eight miles a day for hundreds of miles, during which they develop muscle instead of fat. Consequently, a considerable period elapses after they reach their destination before they are ready for slaughter, whilst many are lost en route. As a result, Australia is greatly handicapped in meat export prices in world markets. The remedy, of course, is the development of railways from the ports to the cattle areas, and this subject is naturally prominent in the minds of the northern cattle rearers.

A further great handicap to the Australian meat industry is the great distance of the producing areas from the meat markets of the Northern Hemisphere. This not only involves higher freight charges, but also means that the beef has to be frozen hard to arrive fresh, whereas beef from the Argentine (which is much nearer) can be merely chilled. This is an important distinction, as chilled meat when thawed is of much better quality than thawed frozen meat. A recent report states that a process has been evolved for chilling beef so as to enable it to stand the long transport. If this process proves practicable for large quantities, it will give a great stimulus to the Australian meat trade.

On the wetter coastal lands in New South Wales and Victoria more attention is paid to the rearing of cattle for milk, butter and cheese than for meat. In this area dairying is an important industry, and there is a large and growing export of butter, whilst considerable but smaller quantities of cheese and condensed milk also are exported.

The cattle industry also provides a valuable export of hides and a small but increasing export of leather.

In the dairying districts, *pigs* are becoming increasingly important, while *horses* are reared in New South Wales, Victoria and Queensland. For desert transport *camels* were introduced into Australia comparatively recently, and now number about 5,000. *Goats*, reared for their milk and hair, thrive in the drier areas (particularly of Queensland).

Forestry and Fishing

FORESTRY. The forested area of Australia is comparatively small as much of the country is too dry for tree growth. There are, however, many valuable and distinctive trees, such as tuart, jarrah and karri in Western Australia and the iron bark and blue gum of the Eastern Highlands. (*See* Chapter 13.)

FISHING, also, is relatively unimportant. The inshore waters and the rivers of the south-east are well stocked with edible fish, which, together with the oysters of the coastal inlets of New South Wales and Queensland, are sufficient to satisfy the home demand, but there is none available for export. There are, however, two fishing industries which provide exports. The first of these is the bêche-de-mer fishery carried on by Malays and Chinese off the tropical northern coasts and on the Great

Barrier Reef. This provides a fish food for export to China. The second is the important pearl fishery along the tropical coasts from Sharks Bay in Western Australia to Torres Strait. This provides mother-of-pearl for export in considerable quantities.

Mining

Mining is an extremely important industry in different parts of Australia. Probably the most important mineral, though now not the most valuable, is *gold*, since this has not only greatly contributed directly to Australia's wealth and progress, but was also largely responsible for populating the country, disappointed gold seekers having been compelled to remain on the land and take to agricultural occupations.

Recently there has been evidence of a recovery, although expensive plant is required to secure paying quantities from the quartz. Western Australia produces 90 per cent. of the total gold output of the Dominion, mainly from the East Coolgardie field (75 per cent.), Kalgoorlie, Mount Margaret, Murchison and Yilgarn, whilst a new field is being developed at Wiluna. Elsewhere, the production of gold is very small. A little is obtained from Ballarat, Bendigo, Beechwood and Castlemaine in Victoria; from Ravenswood, Mount Coolon, Gympie and Etheridge in Queensland (the well-known Charters Towers and Mount Morgan fields are now exhausted); from Bathurst in New South Wales (production at Colar is now negligible); and as a by-product from the copper deposits of Mount Lyell in Tasmania.

Coal is found in considerable quantities in several States, although New South Wales has by far the greatest resources with Newcastle and Maitland (Hunter Valley region), Lithgow (in the Blue Mountains) and Bulli (Illawarra district) as its chief mining towns. Some of the coal is exported, mainly to New Zealand, the East Indies and the Pacific Islands, whilst there is a large coal trade with other States of the Commonwealth, particularly with Victoria. Queensland has deposits near Ipswich, Clermont and Cooktown, while in Victoria much brown coal is mined near Gippsland for use in the generation of electricity. In Western Australia, Collie is the chief centre, and a certain amount is mined in Tasmania in the north-east and near Hobart.

Copper production has declined because of increasing costs of production combined with low prices. Over 70 per cent. of the total output is obtained from the Mount Lyell district of Tasmania, followed by the Cloncurry and Chillagoe districts of Queensland, which produce over 20 per cent. Elsewhere, copper mining is almost negligible.

Iron Ore, of great importance to the future of industrial Australia, is mined at Iron Knob, Iron Monarch and the Middlebank Range in South Australia; at Lithgow in New South Wales; and in Western Australia. The greater part of the Iron Knob deposits are sent to New South Wales for smelting at Lithgow and Newcastle. The total deposits of iron ore in the Commonwealth are considerable but they have not been extensively worked because of inaccessibility, the poor quality of much of the ore, relatively high costs of production and the absence of a large iron and steel industry.

Tin. Mount Bischoff in Tasmania is the chief tin mining area, though New South Wales (New England region) has an output almost as large as that of Tasmania. The metal is mined also in Queensland at Herberton and Stanthorpe.

Other Metals. Broken Hill, in New South Wales, has extensive mines from which *silver*, *lead* and *zinc* are procured. Silver, lead and zinc are mined also in Tasmania, while silver alone is obtained from Kalgoorlie (Western Australia) and Chillagoe (Queensland). *Platinum* is mined at Platina (N.S.W.).

Manufactures

As is only natural, Australia is showing a decided tendency to encourage her own manufactures in preference to importing manufactured goods at considerable cost from distant industrial countries. Her present scanty population somewhat retards this development, and only where population is relatively dense, *i.e.*, at the great ports, is manufacture carried on to any great extent.

The production of machinery, clothing and manufactured foodstuffs offers the greatest scope, and these are most highly developed in New South Wales, which is, however, closely followed by Victoria, where electricity generated from local brown coal is used to drive the wheels of many industries. In Tasmania the abundant supplies of water-power have led to the establishment of important electro-metallurgical industries at Risdon, near Hobart, and at North-West Bay.

Commerce of Australia

The principal *exports* of Australia are wool, wheat, gold, and butter, followed by meat, fruits, flour, lead, hides and skins, sugar, eggs, silver, and milk. The *imports* consist of textiles, petroleum, chemicals, bags and sacks, machinery, paper, motor-cars, iron and steel, tea and stationery.

The bulk of the trade is with the United Kingdom, followed by the United States.

THE STATES OF AUSTRALIA

NEW SOUTH WALES

Area : 309,432 sq. miles. *Population :* 2,600,000.

New South Wales, Australia's leading state, lies in the south-east of the Continent. It may be broadly divided into three regions :

1. **A Narrow Coastal Plain** rising to—
2. **The Eastern Highlands**, which here comprise the New England Range, the Liverpool Range and the Blue Mountains.

3. THE PLAIN OF THE MURRAY-DARLING, including the *Riverina* district, to the west of the mountains.

The coastland and the eastern mountain slopes experience abundant rainfall and a warm temperate climate. The plains are hot in summer, and, as in all other parts of Australia, rainfall diminishes rapidly with distance from the sea.

In the wetter east the plains produce large crops of cereals, mainly wheat, followed by maize and oats, whilst in the drier areas to the west sheep-rearing for the production of wool is an important industry. The coastal belt rears cattle for dairy purposes (butter) and produces a little cane sugar in the north. Sugar is also produced from beet grown in the more temperate areas. The mountains supply much timber, and the mineral wealth includes coal, copper, lead, silver, tin and gold.

[*By courtesy of the Publicity Dept. of the Commonwealth of Australia.*

HARVESTING WITH REAPER AND BINDER, N.S.W.

The picture indicates how the large expanse and the level surface of the land make large-scale operations possible.

All the above products are exported, together with flour, meat, fruit, tobacco, hides, skins, leather and tallow. Much of the trade is with the United Kingdom.

Sydney, the capital, is the most important port of Australia (see page 234). It has a large export trade and is connected by rail with all the important inland towns of New South Wales, including *Bourke* in the north and *Hay* in the south, as well as along the coast north to Brisbane and south-west to Melbourne, Adelaide and Perth. *Newcastle*, north of Sydney, is the coal-mining centre and the second port. It is connected by rail to the upper Darling basin *via* the Hunter Gap. *Broken Hill*, in the west, is a lead, zinc and silver mining centre and is connected by rail to Adelaide and Sydney *via* Cobar.

FEDERAL TERRITORY

This Territory, with an area of 912 sq. miles round *Canberra*, the capital of Australia, comprises and encloses the province given by New South Wales to the nation for the establishment of a neutral zone for the seat of the Commonwealth Government. In 1917, a further small area on Jervis Bay was acquired for purposes of a naval college, and with the right to construct a railway from the capital thereto. Economically the Territory is unimportant, though it is, of course, of great importance from an administrative point of view.

VICTORIA

Area: 87,884 sq. miles; *Population:* 1,800,000.

Victoria lies in the extreme south-east of Australia, with the river Murray forming the greater part of the northern boundary between this State and New South Wales. The main natural divisions are :—

1. The West and North-West, which are a low-lying continuation of the Murray basin.
2. The Narrow Coastal Plain.
3. The Highland Region, between the plain and the coast, with the Australian Alps in the east.

The climate is of the warm temperate type, with sufficient rainfall on the coast and the south-eastern mountain slopes, but with inadequate rainfall on the Murray plain area, especially towards the north (Mildura and Echuca), where irrigation is consequently being practised on a wide scale.

Cereals, chiefly wheat, are produced on the plains, while sheep and cattle are reared in large numbers. The highlands produce timber and minerals are found, more especially gold, at Bendigo and Ballarat. The coastal region produces dairy products and coal in Gippsland, whilst in the drier east both sheep and cattle are reared. Wheat and vegetables are other products of this area.

The principal exports are wool, live-stock, wheat, butter, hides, skins, fruit, gold, tallow and meat (frozen and tinned).

The capital, *Melbourne*, on the Yarra Yarra river, has an excellent harbour, and is the second port of Australia (see page 235). It is the focus of the Victorian railways and lines run north to *Echuca*, north-west to *Mildura* (the site of important irrigation works), west to Adelaide and south to *Geelong*, a port on Port Phillip Bay and the second largest town of Victoria.

QUEENSLAND

Area : 670,500 sq. miles ; *Population :* 980,000.

Queensland is a large state in the north-east stretching from Cape York in the north to New South Wales in the south. The following regions can be distinguished :—

1. The Narrow Coastal Plain.
2. The Highlands, including the northern part of the Great Dividing Range and, in the west, the Selwyn Range.
3. The Northern Low-Lying Plains around the Gulf of Carpentaria.
4. The Inland Plains, partly separated from the northern plains by the Selwyns.

The climate of Queensland is mainly tropical, but the great heat is counteracted over large areas by altitude, while the heavy rainfall of the coastal slopes of the highlands diminishes inland. Thus in the inland region, as in the case of New South Wales and Victoria, irrigation by means of canals and artesian wells is widely practised even for watering cattle and sheep.

The coastal plain is agricultual, producing sugar, bananas and maize. Minerals, including copper, gold, coal and tin, are found in the highlands. In the west, the Barkly Tableland and the Selwyns form part of the Western Plateau of Australia. This is mainly a cattle raising region, though copper is mined at *Cloncurry*. The northern plains are unimportant, although suitable for cattle.

The inland plains, forming part of the Great Artesian Basin of Australia, constitute a savannah region supporting herds of beef cattle, whilst the more arid south-west is devoted mainly to sheep rearing, and wheat is produced in the south, which adjoins the wheat belt of New South Wales. Irrigation is very important in this inland region.

Queensland's principal exports are meat (preserved or frozen), hides, skins, tallow, wool, butter, cheese, sugar, timber, lead, pearl-shell and bêche-de-mer.

In addition to the railway running south along the coast and connecting with the south-eastern railway system of the Continent, there is a line running north along the coast from Brisbane, while further lines run inland from the ports to mining and agricultural centres. Aviation is being encouraged and should become important owing to the absence of other forms of transport and the long distances between towns and settlements.

Brisbane, the capital, is situated in the south-east on the Brisbane river (see page 236). *Maryborough* (a sugar centre), *Rockhampton* (a cattle-collecting centre) and *Townsville*, are rising ports to the north of Brisbane. *Toowoomba* is a market centre for the Darling Downs, while *Cloncurry* is a mining centre.

SOUTH AUSTRALIA

Area : 380,070 sq. miles ; *Population :* 580,000.

South Australia, situated west of New South Wales and Victoria and east of Western Australia, may be divided into the following regions :—

1. THE LOWER MURRAY BASIN in the south-east.
2. THE HIGHLANDS, running from Kangaroo Island in the south to the Lake Eyre Basin and including the Flinders Range in the north.
3. THE RIFT VALLEY, including Lake Torrens in the north and running south to Spencer's Gulf, the Yorke Peninsula and St. Vincent Gulf.
4. THE LAKE EYRE INLAND DRAINAGE BASIN in the north-east.
5. THE PLATEAU REGION in the north-west—a part of the Western Plateau of Australia.
6. THE COASTAL REGION in the south, including the Gawler Range and the Eyre's Peninsula in the east and part of the Nullabor Plain in the west.

The south-east has a Mediterranean type of climate. Northwards the temperature increases and rainfall decreases, until the north-west merges into the Australian desert plateau. The Lake Eyre region lies in the Great Artesian Basin of Australia.

The *Lower Murray Basin* produces fruit, wine, vegetables, dairy products, wool and wheat. Irrigation is important in this region, *e.g.*, at Renmark. The *Highlands* are forested and in the valleys sheep and cattle are reared, providing a large production of wool and dairy produce, whilst in the north wheat and mixed farming are carried on. But the chief product is wine from the vines grown on the hill slopes, this region producing the bulk of Australia's wine production. The southern plains of the *Rift Valley* produce a large proportion of the wheat and wool production of South Australia. The *Lake Eyre* region is unimportant except for its underlying resources of artesian water. The *Plateau and Coastal* regions are developing as wheat and wool producers, whilst Eyre's Peninsula contains the iron deposits of Iron Knob.

The leading exports are wool, wheat, flour, barley, iron ore, meat, butter, eggs, wine, fruits, hides, skins, tallow and sandalwood.

Adelaide, the capital of South Australia (see page 235), is well connected by rail with the towns and ports of Victoria and New South Wales, as well as with Perth in the west by the transcontinental railway, *via* Port Augusta on Spencer's Gulf. A line, part of the projected north-south transcontinental railway, also runs to *Oodnadatta* in the north, and thence to Alice Springs in Central Australia.

Port Augusta, Port Lincoln and *Port Pirie* are wheat ports, while Port Pirie also has smelting works and is the chief outlet for the minerals obtained from Broken Hill in New South Wales.

NORTHERN TERRITORY

Area : 523,600 sq. miles ; *Population :* 22,000.

Northern Territory, formerly administered as the two states of North Australia and Central Australia, is of little economic importance. It is peopled mainly by aboriginals, numbering nearly 20,000.

Central Australia is part of the desert plateau, and only a small area in the centre is at present capable of development, mainly on pastoral lines. The chief town is *Alice Springs*, linked to South Australia by rail.

North Australia is monsoonal in the north, but the lack of coloured labour is retarding development. Further south, cattle raising is making progress. North Australia has considerable mineral wealth, but this, too, is little exploited because of the lack of suitable labour.

Darwin, the capital, situated on the north-west coast, has a railway running south which is eventually to go to Alice Springs, to connect up with the transcontinental railway from Adelaide and Port Augusta. This line should do much to open up the country. Darwin is also likely to become an important air station on the England–Australia air route.

WESTERN AUSTRALIA

Area : 975,920 sq. miles ; *Population :* 440,000.

Western Australia is composed of a large part of the Western Plateau area, together with a narrow coastal plain. It is best divided into regions on the basis of climate, *viz.* :—

1. The Mediterranean Region in the extreme south-west.
2. The Monsoon and Savannah Area of the north and north-west.
3. The Desert and Semi-Desert Region covering the remainder and the greater part of the State.

The *Desert* is economically important only because of its numerous gold-fields. The most important of these is the Coolgardie Field, on which the chief gold mining centres are *Coolgardie* and *Kalgoorlie*, both situated on the east-west transcontinental railway. As there is practically no rain in this area, water has to be pumped there from the Swan River, 350 miles to the west. In few parts is there sufficient vegetation to support cattle.

The *Monsoon Region* in the extreme north is unlikely to develop rapidly owing to the restriction on coloured labour, but the *Savannah* region is capable of development as an important cattle rearing and meat producing region.

In the *Mediterranean Region* production varies with the amount of rainfall received. The extreme south-west corner is the wettest area, and here the jarrah, karri and tuart woods grow. In the drier areas to the north-east wheat is grown in large quantities, whilst Mediterranean fruits also are produced. In the regions of lowest rainfall, sheep-rearing is the chief occupation.

Western Australia's principal *exports* are wheat, wool, gold, timber, pearls, pearl shell, hides, skins, fruits and wine.

The south-west is the only area with any pretensions to a railway system, although lines run inland from *Geraldton* on the coast to the Murchison Goldfields in the middle west, and, in the north, to the Pilbara Goldfields. There is thus an impetus to coastal traffic by sea, while aviation is rapidly developing as a means of linking up the widely separated parts of this State.

Perth, the capital, is on the Swan River, in the south-west. It is served by the port of *Fremantle*, which is Australia's first port of call for European steamers, and which exports mainly gold, wool, fruit and wheat. *Albany*, a port on King George Sound in the extreme south of the State, is declining in importance as it has only a small hinterland. *Derby* (linked by an air route to Perth), *Wyndham* (on Cambridge Gulf), and *Port Hedland* (the outlet of the Pilbara Goldfields), are three northern ports.

TASMANIA

Area : 26,215 sq. miles ; *Population :* 220,000.

Tasmania is cut off from Australia by Bass Strait. The centre and west form a high plateau, separated from a lower north-eastern plateau by the low, narrow valley of the Tamar River. Sea influences and elevation make the climate warm and equable, while the Westerlies bring rain throughout the year, with a predominance on the west coast. The climate is therefore of the oceanic type, similar to that of the British Isles.

Fruit-growing is the leading occupation, the production of apples being particularly important, while the west has temperate softwood forests suitable to the development of a pulp and paper industry. There are also extensive mineral deposits, including tin (Mount Bischoff), silver and lead (Mount Zeehan, Mount Lyell and Mount Farrell), copper and gold (Mount Lyell), steam coal (Fingal) and zinc.

The climate is suitable for the rearing of good quality sheep, which are sent to the mainland to assist in maintaining the quality of the stock. In the north and south-east cattle are reared for dairy purposes. Water power, as already mentioned, has led to the development of an electro-metallurgical industry, whilst jam-making is very important.

Apples form the principal export, followed by zinc, woollen goods, wool, potatoes, jam, butter and cheese, hides and skins, hops and timber.

Hobart, the capital and chief port, is situated at the mouth of the Derwent in the south-east. It has important jam-making and canning industries, and is the railway centre. The second largest town and port is *Launceston*, situated on the north coast at the mouth of the Tamar.

NEW GUINEA

Area : over 300,000 sq. miles ; *Population :* about 46,000.

New Guinea is the world's second largest island, if we exclude the island continents. It lies just south of the Equator, to the north of Australia, and is a detached part of that continent from which it is separated only by very shallow seas. The island is divided politically into DUTCH NEW GUINEA in the west ; the TERRITORY OF NEW GUINEA, under Australian mandate, in the north-east ; and PAPUA (British New Guinea), an Australian dependency, in the south-east. The population includes only some 3,000 whites.

The island is long and narrow with a mountainous northern and central area, and lowland in the south, drained by the navigable *Fly* and other rivers.

The climate is hot but equable, and the rainfall heavy. The central mountains act as a dividing line between the northern area, receiving its heaviest rains from the monsoons occurring in the southern summer, and the southern area, receiving its maximum rainfall from the South-East Trades during the southern winter.

The lowlands are naturally covered with vegetation of an equatorial type, and as altitude increases the vegetation passes into savannah with open woodland. Much of the interior is still unexplored, and although there is probably considerable mineral wealth, only gold has been exploited to any extent. The lowlands are unhealthy for white settlers, but they have developed plantations of coconuts, rubber, sisal and cocoa with success near the coast and the white population is increasing. The native population consists of Papuans, a negro tribe addicted to cannibalism.

Port Moresby, on the south-east coast in Papua, is the chief port.

NEW ZEALAND

Area : 103,722 sq. miles ; *Population :* 1,500,000.

New Zealand lies more than one thousand miles to the south-east of Australia, almost in the centre of the water hemisphere. It consists of three main islands—NORTH ISLAND, SOUTH ISLAND, and STEWART ISLAND—together with numerous smaller islands, especially around North Island. North Island is separated from South Island by *Cook Strait*, twenty miles wide at its narrowest part, while *Foveaux Strait* separates South Island from Stewart Island.

Relief of New Zealand

The two main islands are built up around a central chain of mountains running roughly north-east and south-west. Comparatively low in the north of North Island, the land rises towards the south, attaining its greatest height at *Mount Cook* (12,349 feet) in South Island. The mountains are divided into various ranges comprising the *Raukumara, Kiamanawa, Ruahine* and *Tararua* Ranges in North Island; and the *Southern Alps* of South Island. Stewart Island is merely a detached portion of the Southern Alps.

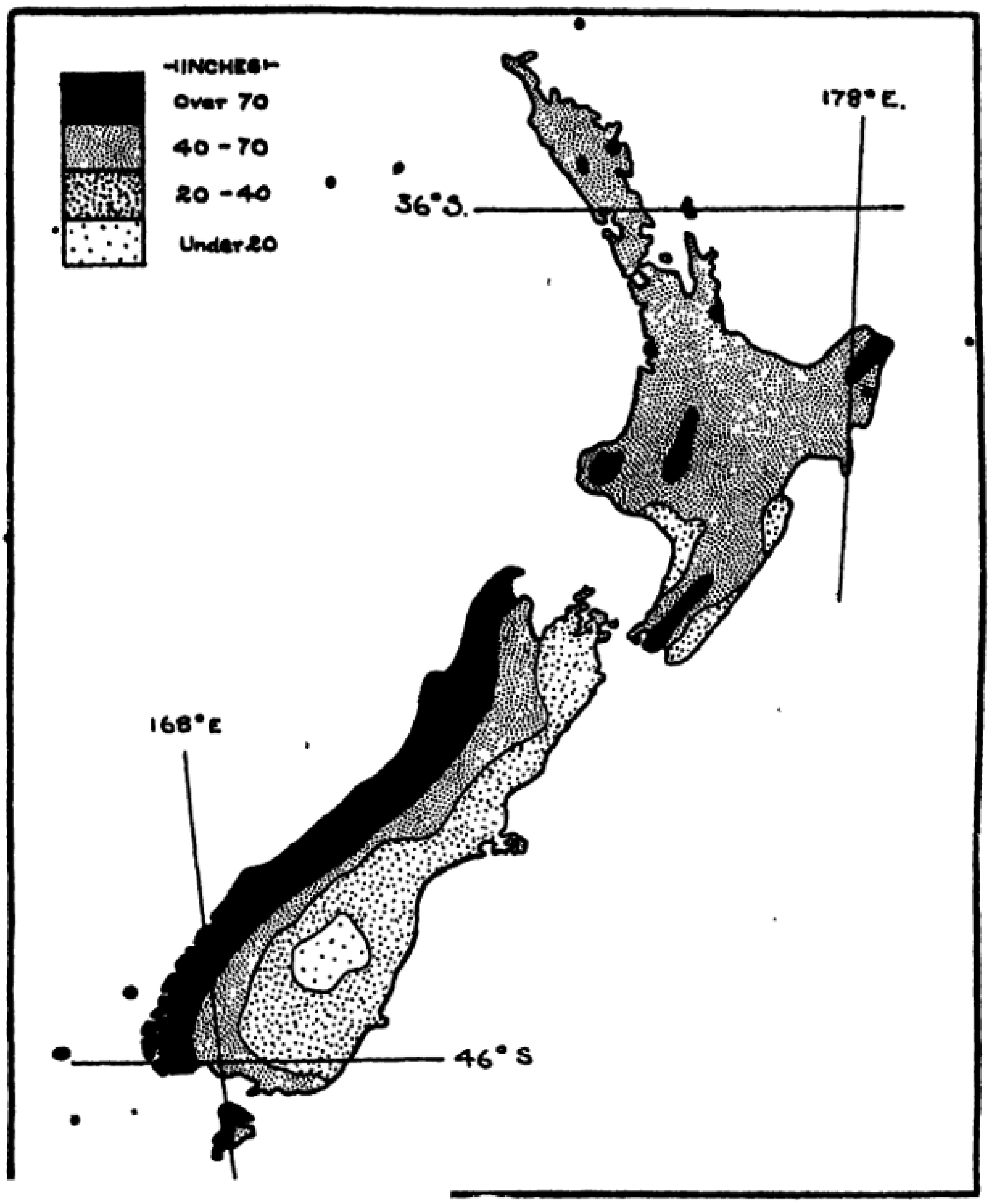


FIG. 185: MEAN ANNUAL RAINFALL OF NEW ZEALAND.

The rivers flowing to the sea from these mountains have built up fertile plains which vary in extent from wide areas to a mere coastal strip. The chief plain areas all lie to the east, with the exception of the Auckland district in the north of North Island. In North Island, *Hawke's Bay* and *Wellington* form the largest areas, and in South Island the chief lowlands are the *Canterbury* and *Otago* districts. As the greatest elevation is towards the west, the longest rivers flow eastwards, but none is of sufficient length to be of much use for navigation.

The general character of the mountain range is not unlike that of the mountainous backbone of Scandinavia, for it contains many glaciers, is fringed in the south with majestic fiords called "sounds," and on its landward side the valleys contain long, narrow lakes from which the rivers, broken by rapids and falls, rush to the east coast, providing abundant supplies of water-power. In North Island the mountains

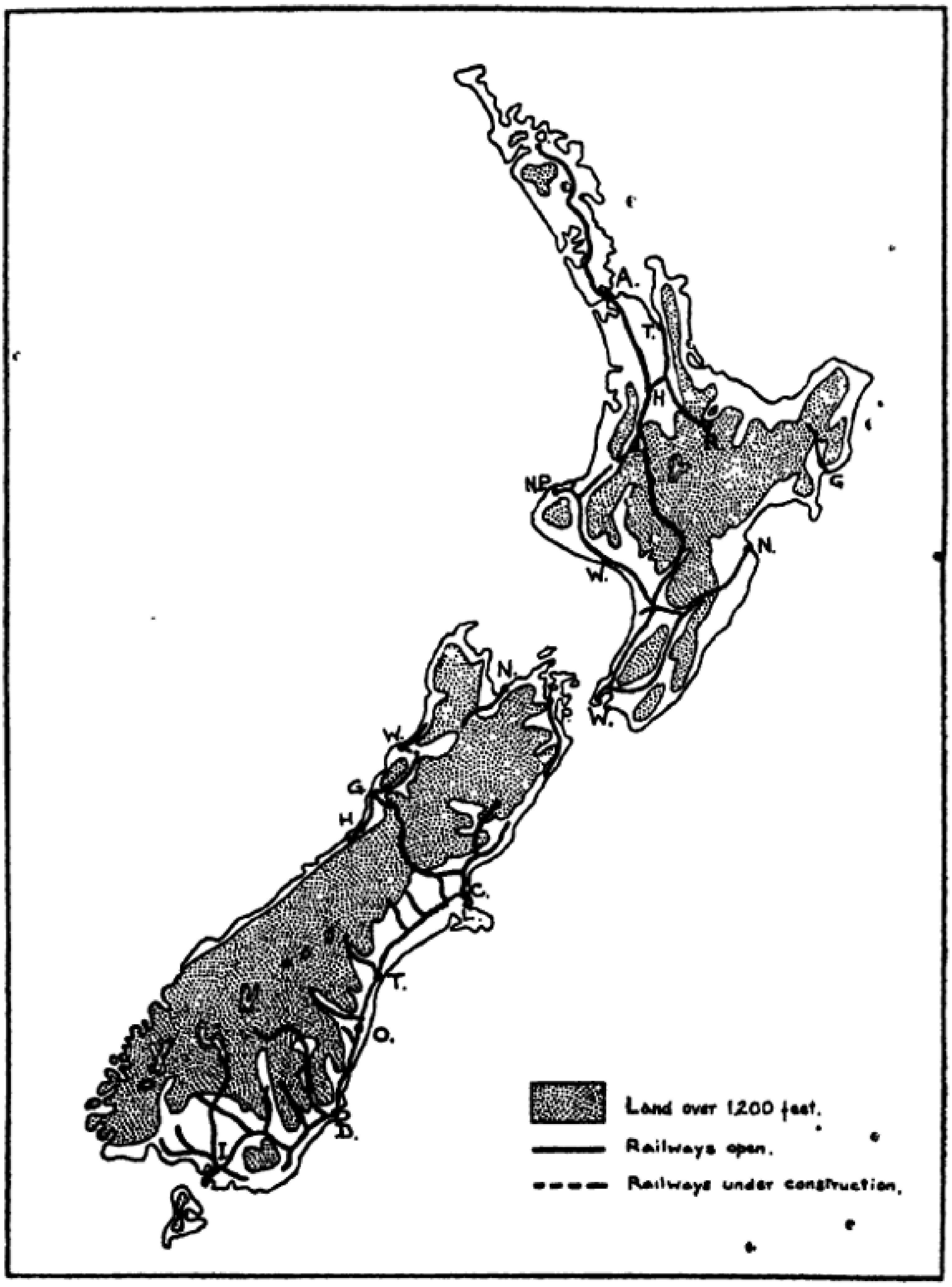


FIG. 186: THE PRINCIPAL RAILWAYS OF NEW ZEALAND.

are lower and less continuous than those of South Island and are volcanic in character, their geysers, hot springs and lakes of boiling mud being world-famous.

Climate of New Zealand

Although both islands receive rain at all seasons, in North Island most of it falls in winter, whereas in South Island there is very little difference in the seasonal fall, although there is a slight increase in autumn. Over the whole of North Island the rainfall is very uniform owing to the distribution of high land and the average precipitation amounts to about 35 ins. per annum. In South Island, however, the Southern Alps cause heavy rainfall on the west coast, where the annual total is as much as 90 ins., while the east coast, which lies in the rain shadow of the mountains, receives about 30 ins. each year.

The ocean surrounding New Zealand has a great modifying effect on the temperature of the islands, with the result that the annual range is exceptionally small. The climate of North Island may be regarded as a much modified form of Mediterranean climate, whilst that of South Island is similar to that of Britain, though rather more equable and warmer owing to sea influences and lower latitude.

Vegetation

Both the climate and soil of New Zealand are excellently suited to the growth of forest and grassland, and only the highest peaks are devoid of vegetation. Naturally, the wettest parts are the more forested, while the grasslands lie generally on the eastern coasts, except in Auckland. While the forest areas are particularly luxuriant, containing many varieties of ferns and creepers, as well as giant trees such as the kauri pine, the natural grass of New Zealand is of a somewhat poor and coarse variety.

Natural Regions

New Zealand can be divided into six broad natural regions, as follows:

NORTH ISLAND:—

1. *The Auckland Peninsula*, with an equable climate, is mainly lowland, with a winter maximum of rainfall.
2. *The East Coast Plain*, extending over Hawke's Bay and Wellington, has a lower rainfall than the Auckland Peninsula and is the principal sheep-rearing region.
3. *The Central Highlands*, consisting of parallel ranges, are a continuation of the Southern Alps.

SOUTH ISLAND:—

4. *The Otago Plateau*, sloping gently to the south, is a well-watered region with an equable climate.

5. *The Canterbury Plains*, on the east, lie in the rain-shadow of the Southern Alps.
6. *The Southern Alps*, running from the south-west to the north-east, cover the whole of the western half of the island, leaving but a very narrow coastal plain in *Westland*.

Communications

The natural means of communication in the Islands are as poor as those of Australia, with the result that much dependence is placed on the roads and railways. By these means, the larger towns, almost entirely confined to the coastal districts, are linked together, especially by the main railway lines which run along the coastal plains to avoid the mountainous districts as much as possible (*see* Fig. 186). Only in one place are the Southern Alps crossed by the railway, this being by the line which passes through the five-mile *Otira Tunnel* on its way from Christchurch in the east to Greymouth and Hokitika in the west. Communications are naturally easier in North Island, where the highlands are less compact than in South Island.

Industries

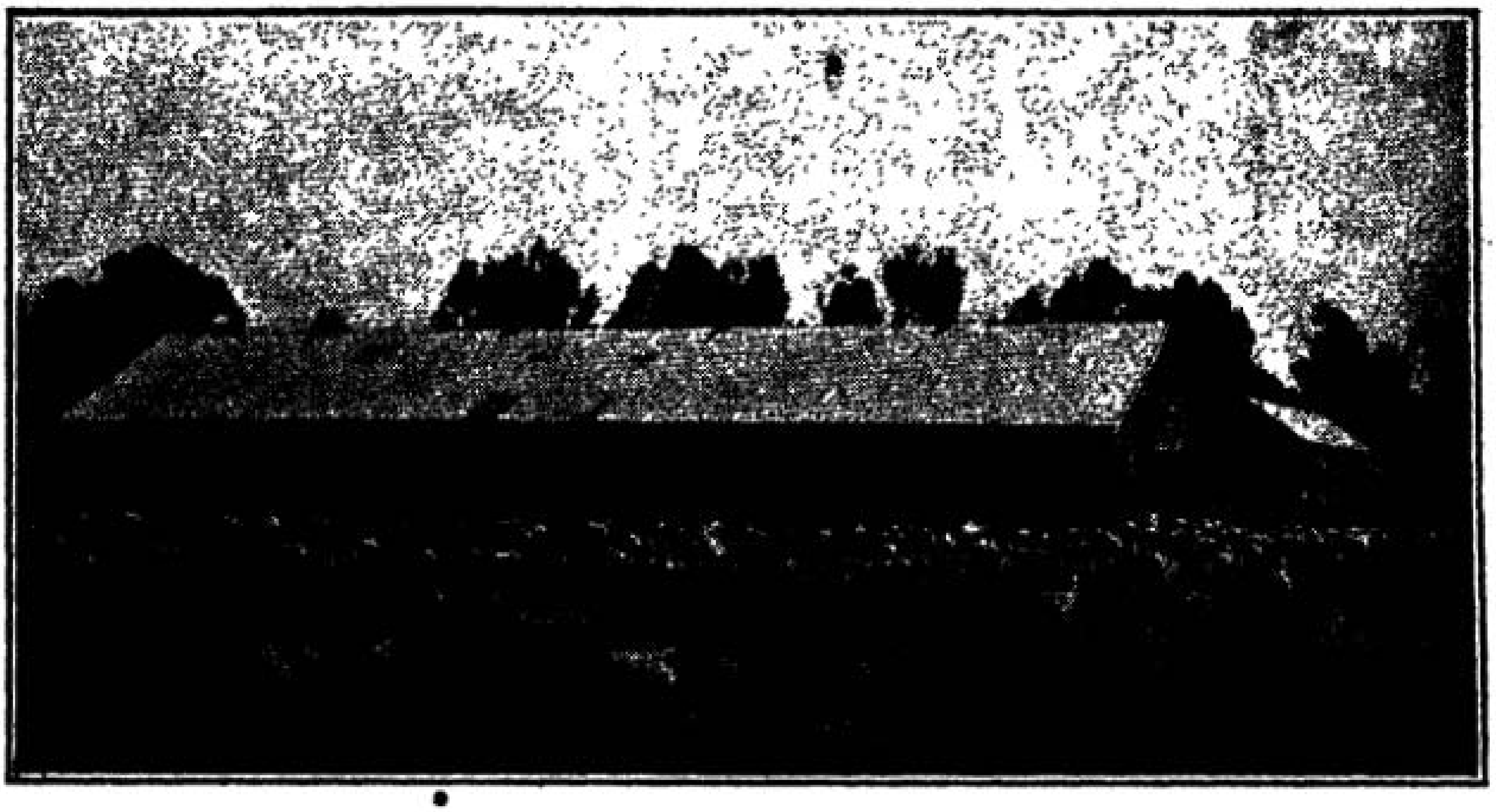
FORESTRY is an important local industry of New Zealand. The export of dairy produce gives rise to a considerable demand for pine wood for boxes, while kauri gum, which is dug out of the ground in a fossilized state as well as collected from living trees, forms an important export of Auckland. Considerations of economy and ease of construction have made timber the most common form of all building materials and most of the houses are largely of timber construction. Each year, however, the imports of timber greatly exceed the exports.

PASTORAL AGRICULTURE is by far the most important industry. The Dominion's economic prosperity is pre-eminently based upon the sheep and cattle industries, which provide over 90 per cent. of her total exports.

Originally the *sheep* were reared almost entirely for their wool, but when the improvement of cold storage facilities made it possible for New Zealand to supply distant overseas markets with meat, mixed breeds of sheep were introduced to provide both wool and mutton. The chief sheep-rearing districts are those of Hawke's Bay and Wellington in North Island, and Canterbury, Otago, Southland and Marlborough in South Island.

The breeds of sheep vary with relief and climate. Wool-producing merino sheep are found on the hills and downs of South Island and the Corriedale (cross-bred) sheep of the Canterbury Plains are the source of the well-known Canterbury "lamb," as well as producing good quality wool. The Romney breed is reared in the moister regions of North Island, whilst Southdowns provide lamb in both Islands.

Prior to the invention of refrigeration, the export products of the pastoral industry were confined to wool, hides, skins and tallow, whereas refrigerated products (butter, frozen meat and cheese) now provide about 70 per cent. of the total exports.



[*By courtesy of the High Commissioner for New Zealand.*

SHEARING TIME AT HAWKE'S BAY, NEW ZEALAND.

Cattle, too, are extensively reared, especially in Auckland and Wellington, for both *beef* and *dairy produce*. The excellent climate and the richness of the pastures have made dairying very important, and butter is the leading export of the Dominion, whilst there is also a large export of cheese.

Pigs and *horses* are becoming increasingly important, especially in the Canterbury and Auckland districts. The pig industry provides ham and bacon, which at present are produced for local use only, but a valuable export trade may well be developed.

AGRICULTURE. The actual cultivation or tilling of the soil is much less important than the pastoral industry, and even where it exists mixed farming is the general rule. The rich soil and drier districts of the Canterbury plains produce *wheat*, whilst *oats* are more suited to the cooler and wetter Otago district. *Barley* for brewing is grown around Nelson (South Island), and *maize* in the Hawke's Bay district. This latter region also produces the so-called New Zealand "flax" or *phormium tenax*. There are great possibilities in the *fruit* industry, and although it has been slow in developing, with careful supervision to ensure first-class quality the export of fruit is annually increasing. Apples and pears are grown in Hawke's Bay, Wellington and Nelson, whilst Otago and Auckland produce apricots and oranges respectively.

MINING is confined largely to *coal* and *gold*, the output of the latter showing a steady decline in recent years. The gold districts are in Auckland, and in the Westland and Otago districts of South Island.

Coal is the most valuable mineral, but is insufficient for home needs. Bituminous coal is mined around Greymouth and Westport, on the west coast of South Island. This is the leading coal-mining area of the Dominion. Coal of varying quality is also mined in Auckland, Canterbury, Otago and Southland.

Of other minerals, small quantities of petroleum, iron, sulphur and silver are worked.

MANUFACTURES. In spite of an abundant supply of power in the form of coal and water-power and of the presence of a wide range of raw materials, manufactures are at present unimportant because of the distance from markets and the scarcity of labour. They are at present confined to those connected with the agricultural industries, such as packing materials and general engineering, whilst the abundance of water-power has led to the development of electrical schemes.

Towns and Commerce

All the chief towns of New Zealand are seaports and in them is concentrated most of the population. There are, however, only three, Christchurch, Auckland and Wellington, with over 100,000 inhabitants.

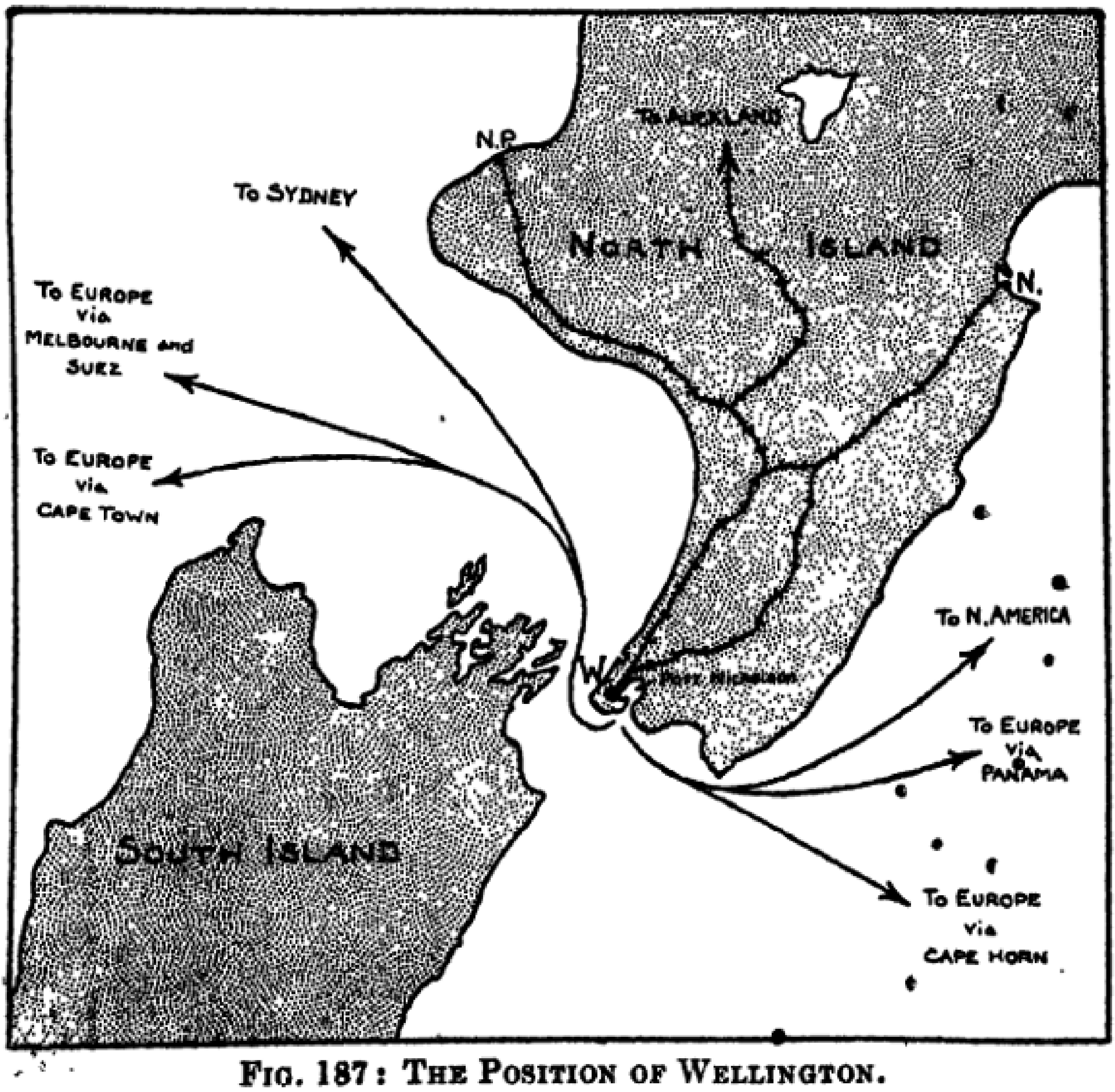


FIG. 187: THE POSITION OF WELLINGTON.

Wellington, the capital of the Dominion, has a fine harbour on the south coast of North Island facing Cook Strait. It has an important export trade in dairy produce, meat, wool and fruit, and has numerous industries connected with this trade, such as preserving factories. It is also a large railway centre and commands the trade routes through Cook Strait.

Auckland, situated on a narrow isthmus of North Island between Hauraki Gulf and Manukau Harbour, is the largest town of New Zealand and has two harbours, one on each side of the isthmus, Waitemata, on the east, being more used than Manukau on the west. Auckland is an important collecting centre for New Zealand and the Pacific Islands, and exports kauri gum, " flax " and dairy produce, having also saw mills, shipbuilding yards and fruit preserving factories.

Napier, on Hawke's Bay, is the outlet for an agricultural region and has railway connections with Wellington. It exports wool and mutton.

Christchurch, the third city of New Zealand and the chief town of the Canterbury plains, stands at the eastern end of the Arthur's Pass route by which the railway crosses the Southern Alps. Through its outport, *Lyttelton*, it exports much wool and frozen mutton (" Canterbury Lamb"). It is also a railway centre with railway repair shops and wagon works.

Dunedin, on Otago Harbour, exports the agricultural produce and gold of its hinterland, and has numerous electrically-worked factories, chiefly woollen mills.

Invercargill, the most southerly town of South Island, has a rather poor harbour. It exports wool and meat. *Oamaru*, on the east coast, is an important wheat port, while *Timaru*, in the Canterbury area, has a large trade in frozen meat.

Much of New Zealand's trade is with Great Britain, but the nearness of America is tending to lessen this, despite the preferential tariffs still imposed in favour of the Mother country. The chief *exports* are butter, frozen meat, wool, cheese, hides and skins, gold, tallow, fruit, kauri gum and timber. The main *imports* are textiles, motor-cars, iron and steel, machinery, and petroleum.

PACIFIC ISLANDS

The thousands of small islands scattered over the Pacific Ocean are collectively known as the Pacific Islands. With the single exception of NEW CALEDONIA, which is probably a detached portion of the Australian continent, all the Pacific Islands are either of volcanic or of coral formation, the former being known as the " high " islands and the latter as the " low " islands. The islands are divided into three groups corresponding to the types of people inhabiting each group :—

1. THE MELANESIAN GROUP. These islands are called " Melanesian " because they are inhabited by a black-skinned race, the term

"Melanesia" meaning "the islands of the blacks." The group lies east and south-east of the island of New Guinea.

2. The Micronesian Group, or "the small islands", includes the many islands lying around lat. 10°N. They are inhabited by a race of mixed extraction, probably a result of the intermingling of the Melanesians and Polynesians.
3. The Polynesian Group, or "the many islands," are inhabited by a brown-skinned race. These islands lie east and north of the Melanesian and Micronesian Groups and include the Hawaiian Islands.

Political Status

The Pacific Islands are distributed politically among the great powers, as indicated below. The situation of the islands mentioned can best be ascertained by reference to a good atlas.

British Islands. The *Bismarck Archipelago* and the former German *Solomon Islands*, situated east of New Guinea, are administered by Australia under mandate, whilst *Norfolk Island*, an important cable station lying east of Australia, is a dependency of the Commonwealth.

Auckland Island (south of New Zealand), the *Chatham Islands* (east of New Zealand) and the *Cook Islands* (lat. 20°S., long. 160°W.) form part of the Dominion of New Zealand. The Dominion also holds the *Antarctic coasts* and adjacent *Islands of the Ross Sea* as a dependency, and the *Western Samoan Islands* (north-west of Cook Islands) under a mandate.

The *Fiji Islands* form part of the British Empire, together with the *Tonga* (or *Friendly*) *Islands*, the *Gilbert and Ellice Islands*, the *British Solomon Islands* and part of the *New Hebrides*, all of which lie east of Australia and New Guinea between long. 150°E. and long. 170°W. These islands are all controlled by the Governor of Fiji.

Nauru Island, situated almost on the Equator on long. 167°E., is administered under a mandate conferred on the British Empire.

United States. The *Hawaiian Islands* (or *Sandwich Islands*), situated almost on the Tropic of Cancer midway between Asia and North America in long. 155°W., are the most important of the Pacific Island possessions of the United States. *Guam*, in the Mariana, or Ladrone, Group east of the Philippines, and part of the *Samoan Islands*, also belong to the United States.

France controls part of the *New Hebrides*, *New Caledonia*, lying east of Australia, and the group of islands lying south of the Equator between long 160°–135°W., including the *Society Islands*, the *Marquesas Islands*, the *Austral Islands* and the *Low Archipelago* or *Tuamotu*.

Japan controls, under mandate, the *Mariana* or *Ladrone Islands* (with the exception of Guam), the *Caroline Islands* and the *Marshall Islands*, all of which lie east of the Philippines.

Climate and Products

The climate of the Pacific Islands as a whole is hot, but not unpleasantly so, as their maritime situation makes them equable and pleasant places in which to live. The rainfall is abundant and is distributed throughout the year, the season of maximum rainfall varying with situation and being dependent on the swing of the wind systems. The "high" islands naturally receive more rainfall than the "low" islands and their windward sides, which are most abundantly watered, are generally well-timbered.

Many of the Pacific Islands are very fertile, particularly those of volcanic origin, which have a more varied relief and a rich volcanic soil. The most important product is copra, from the coconut, which forms a valuable export of most of the islands, while the coconut is important as a food for the natives. Other local food products are fish, yams, bananas and other fruits. On the more fertile "high" islands plantations producing sugar, coffee, rice and other products have been laid out by Europeans. Minerals are present on some of the volcanic islands but they have been little exploited, the most important at present being phosphate, obtained mainly from Nauru and Ocean Islands—the latter in the Gilbert and Ellice group.

Economically, the most important of the islands are the Fiji Islands, the Samoan Islands and the Hawaiian Islands.

Fiji Islands

The Fiji group consists of about 250 volcanic islands, of which only about 80 are inhabited. The total area is a little over 7,000 sq. miles, and the population about 190,000, including 95,000 Fijians and 79,000 Indians. There is a considerable area of forest land, producing hard and soft wood, and saw-mills have been established. The most important product is the coconut, followed by the sugar-cane, rice; bananas, cotton and pineapples, which account for the leading exports. Molasses from sugar and copra from coconuts also are exported.

Suva, the capital, is situated on the south of Viti Levu, the largest island of the group. The port is an entrepôt for the neighbouring islands and is also an important fuelling station and port of call for vessels trading between Western North America and Australia.

Samoan Islands

The Samoan Islands are mainly of volcanic formation, surrounded by coral reefs. They have a total area of about 1,206 sq. miles, the area of Western or British Samoa being 1,130 sq. miles and of American Samoa 76 sq. miles. The former has a population of nearly 50,000 and the latter of about 10,000 persons. The chief products and exports are copra, cocoa and bananas, whilst rubber also is cultivated.

Apia, the chief port of the group, is on the British island of Upolu. It acts as an entrepôt for the group and has steamer connection with Fiji and New Zealand. *Pago-Pago*, in Tutuila, is an American naval station and the calling place for trans-Pacific mail steamers.

Hawaiian Islands

The Hawaiian Islands are a group of volcanic islands situated in the centre of the Pacific about 2,000 miles south-west of San Francisco. The area of the islands is about 6,400 sq. miles and the population about 380,000, comprised of mixed races, Japanese predominating, and including only 22,000 Hawaiians. Sugar and pineapples are the leading products and exports, but coffee, hides, bananas and wool also are exported. The tinning of pineapples for export to American markets is an important industry.

The largest island of the group is HAWAII, in which is situated the large and well-known active volcano of Manuo Loa, with the smaller active Kilauea nearby.

Honolulu, the capital and port, is situated on the island of Oahu and is an important port of call on the Pacific trade routes between North America and the Panama in the west and Asia and Australia in the east.

QUESTIONS ON CHAPTER 28

1. Draw a sketch-map of *either* Australia *or* New Zealand showing the areas of production of the principal raw materials and foodstuffs produced for export. (*I. of B., Pt. I*, 1931)
2. Draw a sketch-map of Australia showing the principal lines of communication and the chief ports. Indicate recent developments. (*I. of B., Pt. I*, 1930)
3. What raw materials of any kind do we import from Australia ? Name, and locate, the areas and the ports from which the main supplies of each product come. (*R.S.A., Stage I*, 1928)
4. Compare New Zealand as regards latitude, extent, and climate with the British Isles. Give a brief account of the development of New Zealand industries and the trade carried on with Great Britain and Ireland. (*C.I.I. Prelim.*, 1931)
5. Which Australian State has the largest population ? Which is most extensive in area ? Which has the largest trade in imports and exports ? How do you account for this ? (*L.A.A. Prelim., June*, 1930)
6. Give some idea of (*a*) the size of Australia, (*b*) the number of inhabitants, (*c*) their occupation, (*d*) its chief products. (*L.A.A. Prelim., Dec.*, 1930)
7. What do you know of Tasmania ? (*L.A.A. Prelim., June*, 1931)

8. The population of Australia is roughly six millions. India, with a smaller area, has a population of roughly 350 millions. What reasons can you suggest to account for the low population of Australia as compared with that of India? (*C.I.S. Prelim.*, *Dec.*, 1930)

9. Say what you know of the possibilities for the development of tropical and sub-tropical products in Australia. (*I. of B.*, *Qual.*, 1929)

10. What natural conditions have led to the greater development of the South-Eastern portion of Australia, and what are the chief industries? Compare these conditions with those found in parts of South Africa. (*C.I.I. Prelim.*, 1928)

11. Draw four maps of Australia to show respectively:—
    - (*a*) The arid areas and the areas served by artesian bores;
    - (*b*) The areas of densest population;
    - (*c*) The areas where fruit, gold, dairy produce, and coal are obtained;
    - (*d*) The chief seaports and their main railway connections. (*L.C. of C.*, *Junr.*, 1931)

12. Draw a sketch-map of Australia and indicate upon it the principal natural regions. Describe, and as far as possible account for, the natural vegetation in each of the regions. (*L.M.*, *Jan.*, 1930)

13. Write an explanatory account of the distribution of population in Australia, with special reference to areas which are exceptionally densely or exceptionally sparsely peopled. (*L.M.*, *June*, 1925)

14. Summarise both the import and the export trade of Australia. Describe in detail two important trade routes between Australia and Great Britain. (*L.M.*, *Jan.*, 1931)

15. Write an explanatory account of the distribution of population in New Zealand. (*L.M.*, *Jan.*, 1931)

16. Contrast the South Island of New Zealand with the Cape Province of South Africa in respect of relief, climate, resources and industries. (*L.M.*, *June*, 1926)

17. Give an account of the mining industries of the Commonwealth of Australia. (*L.M.*, *June*, 1926)

18. Show that pastoral industries are more important than crop-producing industries in New Zealand. (*L.M.*, *June*, 1926)

19. Examine the geographical conditions affecting the economic development of tropical Australia. (*Univ. of London Inter. B.Sc.* (*Econs.*), *July*, 1933)

20. Over 90 per cent. of the people of Australia live within 150 miles of the coast. Write a brief geographical explanation of this fact. (*I. of B.*, *Pt. I.*, 1934)

CHAPTER 29

NORTH AMERICA

The continent of North America, which forms the larger part of what is known as the New World, has an area of 8,052,799 sq. miles and supports a population of about 150,000,000. The continent is separated from Europe by the Atlantic Ocean, and from Asia by the Pacific Ocean, though in the north-west this narrows to the Bering Strait which divides Alaska from eastern Siberia. North of Canada is the Arctic Ocean, with its various divisions, of which the Beaufort Sea and Hudson Bay, a southern extension, are the most notable; while southwards the whole continent is joined to South America by the narrow Isthmus of Panama across which is cut the Panama Canal.

Politically the continent comprises ALASKA (which belongs to the United States) in the north-west; CANADA and NEWFOUNDLAND (members of the British Commonwealth of Nations) in the north; the UNITED STATES OF AMERICA (a republic) south of Canada; and the republic of MEXICO in the south.

PHYSIOGRAPHY OF CANADA AND THE UNITED STATES

Relief

A study of a relief map of North America will show that the continent is clearly divisible into four broad physical regions: (1) the EASTERN HIGHLANDS; (2) the WESTERN HIGHLANDS; (3) the CENTRAL PLAINS between the two highland masses, and (4) the COASTAL LOWLANDS.

THE WESTERN HIGHLAND or CORDILLERAN REGION is not one continuous chain, but is built up of a series of comparatively recent fold mountains. The eastern side of these highlands is formed by the towering *Rocky Mountains*, which stretch from Alaska in the north to Honduras (Central America) in the south, forming a high backbone which runs right along both western Canada and western United States and forms the main watershed of both these countries. Immediately to the west of the Rockies in Canada, and separated from them by a narrow plateau region, is the *Selkirk Range*.

Both Canada and the United States have a *Coast Range* on the west, that of Canada being continued in the United States as the Sierra Nevada, whilst the Coast Range of the United States, entirely distinct from that of Canada, can be traced nearer the sea than the Sierra Nevada and can be seen to continue through Vancouver Island and the drowned indented coastline of western Canada.

The western mountains of North America everywhere approach close to the seaboard and so make a precipitous coastline, particularly in the north.

Between the Coast Range of the United States and the Sierra Nevada lies the California Valley, a fertile, alluvial region drained by the Sacramento and San Joaquin Rivers and with only a narrow entrance to the sea in the *Golden Gate*, guarded by San Francisco. The Rockies frequently rise to a height of considerably over 10,000 ft., and between these and the mountains nearer the coast lie a number of plateaus, widest in the United States, but varying in size and height. The most marked and best known of these plateaus are the *Colorado Plateau* in the south-west of the United States, the *Columbia Plateau* in the north-west of the States, and the *Plateau of British Columbia* in south-western Canada.

THE GREAT CENTRAL PLAIN lies to the east of the Rockies. It is really a wide plateau, nowhere less than 500 ft. high and in most places over 1,000 ft. This region stretches across the country in Canada and the northern parts of the United States, and slopes away gradually to the lowlands of the north and south but rises again in the east to the Eastern Highlands.

THE EASTERN HIGHLANDS are divided by the St. Lawrence Valley into the ancient *Laurentides* in Canada, including the Plateau of Labrador, and the Appalachian system in the United States, whilst the *Plateau of Greenland* is a detached portion of this highland region. The *Appalachian Mountains* consist of a series of parallel ranges separated by wide valleys. The ranges receive various names in different localities, the best known being the *Allegheny Mountains* towards the south.

THE COASTAL LOWLANDS. In the east, the Appalachians slope down to the Atlantic Ocean to form a *Coastal Plain*, which is still growing seawards. In the north, the Central Plain slopes to form an extensive plain around Hudson Bay—the *Hudson Bay Lowlands*; whilst in the south, the plain slopes to the Gulf of Mexico, where lies the enormous *Gulf Coastal Plain*, built up by the rivers, especially the Mississippi. This, like the Atlantic plain, is gradually extending seawards.

Lakes of Canada and the United States

The enormous ice-sheet which once covered the northern part of the continent made great depressions in certain areas of the plains. These depressions are now filled with water, forming the greatest lake area in the world, which stretches across the continent from the Alaskan Border to New York, in a north-west—south-east direction.

In the far north are the *Great Bear*, the *Great Slave* and the *Athabaska* lakes, further south *Lake Winnipeg*, and to the south-east of this, between Canada and the United States, the *Great Lake System*, composed of Lakes *Superior*, *Michigan*, *Huron*, *Erie* and *Ontario*.

Rivers of North America

From these lakes great rivers flow to the sea, the *Mackenzie* draining the Slave and Bear lakes and flowing to the Beaufort Sea; the *Nelson* draining Lake Winnipeg to Hudson Bay; and the *St. Lawrence* flowing from the Great Lakes to the Atlantic. The *Saskatchewan* from the west and the *Red River* from the south empty into Lake Winnipeg, while the *Peace* and *Athabaska* Rivers flow from the south-west into Lake Athabaska.

Many rivers flow eastward from the Appalachians to the Atlantic, all of them somewhat short and turbulent and all leaving the mountains for the plain by falls or rapids. Nevertheless, as the eastern part of the United States is the wealthiest and most progressive area in the world, many of these rivers are extremely important, notably the *Hudson*, *Susquehanna*, *Potomac*, *Delaware*, *James* and *Savannah*. The great importance of the first four of these rivers is due mainly to the fact that their valleys provide natural routes through the Appalachians which have been utilised by the roads and railways running to the interior from the great cities and towns of the Atlantic coast. The rivers are also of value because their falls have long been utilised as a source of power, which has been a primary cause of the growth of important manufacturing towns along the "*Fall Line*", *e.g.*, Washington, Richmond, Fall River, Lowell, Columbia and Montgomery.

The greatest river of the continent is the *Mississippi* which, together with its chief tributary, the *Missouri*, forms the second largest river (in volume) in the world. The Mississippi rises to the west of Lake Superior and flows in a general southerly direction for some 2,500 miles before emptying by a wide delta into the Gulf of Mexico. The Missouri rises much further west in the Lewin Range of the Rockies, near the Yellowstone Park, and follows first a north-easterly, then a south-easterly and, finally, an easterly course for 2,500 miles before joining the Mississippi near St. Louis at the edge of the Great Plains.

The principal right-bank tributaries of this system are, from north to south, the *Kansas*, *Arkansas* and *Red* Rivers, all rising in the Rockies, while the chief left-bank tributaries are the *Tennessee* and the *Ohio*, which rise in the Allegheny Mountains, and the *Illinois*, which rises west of Lake Erie. The Missouri and the lower Mississippi have a combined length of some 4,200 miles.

The *Rio Grande*, flowing from the high peaks of the Colorado district, forms the boundary between Mexico and Texas, and empties into the Gulf of Mexico.

On the west coast, the *Sacramento* and *San Joaquin* flow through the beautiful longitudinal valley of California before uniting and breaking through the coast range to the Pacific at the Golden Gate. The *Colorado*, another western river, flows in a transverse valley across the mountains and plateaus, cutting deep gorges (or *canyons*) in the arid regions and eventually emptying into the Gulf of California, which is gradually being filled up by silt brought down by this river. In the north-west the rivers *Fraser* and *Skeena* are short and swift, but they are economically important because they abound with fish and because use is made of their valleys by railways. The *Yukon*, rising in British Columbia and flowing into the Behring Sea, is open to navigation only from May to September.

Coastal Features

In the north-east of Canada and the United States the coast is indented by a number of drowned valleys and inlets, with the result that there are many very good harbours in this area, although several of them, and particularly those near the mouth of the St. Lawrence, are ice bound in winter. In the south, however, the seaboard is gradually rising and the shore waters of the *Gulf of Mexico* are shallow, so that good harbours are few. The west coast has deep water close to the shore, but Hudson Bay in the north is less than 100 fathoms deep. The long Gulf of California, already mentioned, lies between Mexico and Lower California.

Climate of North America

One of the main factors influencing the climate of the continent as a whole is the nature of the relief. In the west, the great Rocky Mountain system prevents the moderating effects of the Westerlies from penetrating inland, whilst on the east the Appalachian Mountains have a similar though rather less important influence as a climatic barrier. On the other hand, the absence of an east-west mountain system, such as, for example, the Himalayas of India, leaves the centre of the continent open to the cold north winds in winter and to the warm, rain-bearing winds from the south-east in summer.

As a result of these conditions and of the vast area of the continent, the different parts of the continent naturally experience a great diversity of climate, which ranges from Arctic conditions in the extreme north to sub-tropical conditions in the south-east and to desert in the south-west. Broadly, eight major climatic regions can be distinguished (excluding Mexico—see p. 620), though it must be remembered that local influences may play an important part in modifying the climate of particular localities.

1. **The Far North**, extending across Northern Canada and Labrador, has an Arctic climate, the precipitation being mostly in the form of snow.

2. **The North-West Coast Region**, roughly from the Gulf of Alaska to southern British Columbia, has a West European or Oceanic type of climate, similar to that of the British Isles. This is due largely to proximity to the ocean and the presence of the warm Pacific Drift, from over which the Westerly winds blow throughout the year. The region is also protected from the cold north and north-east winds by the

high Rocky Mountains on the east. The Westerly winds—having come over the Pacific—are moisture-laden, and heavy precipitation is caused by their having to rise to great heights to pass the mountains. The rainfall decreases from the coast inland, and the leeward slopes and valleys are frequently so dry as to require irrigation before cultivation can be successfully practised.

3. THE NORTH-EAST COAST REGION, extending from Newfoundland to New York, has a cool temperate east coast or Laurentian type of climate. The temperature range is greater than that of the west coast, whilst precipitation is lower and includes a considerable amount of snow in winter. The region is visited by cyclones and therefore the rainfall is greater than it would be otherwise. The prevailing wind is from the west, across the great land mass, and sea breezes from the Gulf of St. Lawrence and the Atlantic have little warming effect because of the cold Labrador current.

4. THE NORTH-CENTRAL REGION, extending from the south of Hudson Bay to latitude 35° N. (near the junction of the Missouri and the Mississippi), is a region of extremes, mainly because of its distance from the sea, and because it is not only shielded from oceanic influences by the Rockies and Appalachians, but is also open on the north to cold Arctic blasts. The climate of this region is, therefore, of the cool temperate interior or Prairie type. The Great Lakes, however, have a considerably modifying influence on their immediate shores, *e.g.*, the peninsula of Ontario, while the temperature naturally varies with latitude. In Alberta, the warm *Chinook* winds blowing from the Rockies melt the winter snows and bring an early spring. The eastern parts have the heavier and more even rainfall because the western part is in the rain shadow of the Rockies, and such rain as this part receives falls chiefly in the summer, when low pressure attracts winds blowing in from the Gulf of Mexico.

5. THE SOUTH-CENTRAL REGION extends southward from the North-Central region to the Gulf of Mexico, and eastward from the Rockies to the Alleghenies. The general features are similar to those of the north-central region but temperatures are higher owing to the lower latitude, so that the climate on the whole is of the warm temperate interior type. Rainfall is considerable, amounting to 40 inches in eastern parts, but decreasing north-westwards as the rain-shadow of the Rockies is reached. Although monsoon effects are felt, rain falls at all seasons of the year.

6. THE SOUTH-EAST COAST REGION, around the Gulf of Mexico, experiences a weak monsoon, or what is usually described as "the Gulf type" of climate, with warm winters and hot summers. Rain falls at all seasons, the maximum being in the summer months.

7. THE CENTRAL WEST COAST REGION, mainly comprising California, has a Mediterranean type of climate, being under the influence of the rain-bearing Westerly winds in winter and the dry, warm, off-shore North-East Trade winds in summer.

8. A **Desert and Semi-Desert Region** exists to the north and north-west of the Gulf of California. This area is shut off from rain-bearing easterly winds by high ranges and receives less than 10 inches of rainfall annually.

THE DOMINION OF CANADA

Area: 3,684,463 sq. miles; *Population*: 10,500,000.

Apart from the territory of Alaska, which belongs to the United States, and the island of Newfoundland and its dependency Labrador in the east, the Dominion of Canada embraces the whole of the northern portion of the North American continent. The political division between Canada and the United States follows, in western districts, the 49th parallel of latitude, but in the east runs through the middle of the Great Lakes and then branches off in a circuitous path south of the St. Lawrence to the Bay of Fundy on the Atlantic Coast.

The Dominion is divided into nine provinces with their own governments. From east to west the provinces are: Nova Scotia, Prince Edward Island, New Brunswick, Quebec, Ontario, Manitoba, Saskatchewan, Alberta and British Columbia. In the north are the Yukon Territory and the North-West Territories, both of which are governed by Commissioners.

Nova Scotia, Prince Edward Island and New Brunswick are frequently referred to as the " Maritime Provinces ", whilst Manitoba, Saskatchewan and Alberta are called the " Prairie Provinces ".

The relief of the Dominion has been generally discussed in the preceding pages.

Climate of Canada

The vast extent of Canada and the variety of the relief give rise to many differences in the climatic conditions experienced in different parts of the country. Although it covers a greater area than that of the United States, Canada, owing to its northerly situation and the vast tracts of useless tundra and arctic regions which it embraces, will never be able to support as many people as its great neighbour. The inhabited portion of the country, to-day, consists of a belt 200–300 miles wide, on the average, and about 3,000 miles long, lying along the United States boundary. To the north of this belt the climate is one of great extremes, but the area has vast economic resources which could be developed were it not for the absence of good means of transport.

Temperature. Except in the coastal region of British Columbia, which has one of the best climates in the world, the winter over the whole of Canada is both long and severe, and the temperature falls below freezing-point for at least one month each year. While the western mountains shut off the interior from the moderating influence of the sea, there is no mountain barrier in the north to prevent the bitterly cold Arctic winds from sweeping over the country. Further, the general slope of the interior is from south to north and so faces away from the sun.

Canada lies, for the most part, in the belt of Westerly winds, and the mild winters and equable climate of the coastal margins of British Columbia are the result of their influence. Just as they bring to the shores of the British Isles the warm Atlantic Drift, so they drive to the Pacific coast of Canada the North Pacific Drift, a warm drift current from the Kuro Siwo, which flows north-west off the coast of Japan.

Behind the coastal ranges, however, the climate is generally one of extremes, similar to that of Central Europe, while east of the Rockies it becomes markedly continental in character. On the high plains at the foot of the mountains (mainly in Alberta), the warm and dry *Chinook* winds exercise a modifying influence, greatly tempering the severity of the winters and enabling grazing to continue throughout the year.

Of the settled regions, Manitoba in the centre experiences the most severe winter, as this province lies in the depression around Lake Winnipeg, and is surrounded by higher land on all sides except the north, towards which it slopes and so receives the full force of the northerly winds from the Arctic. Farther to the east, in the neighbourhood of the Great Lakes, the temperature rises rapidly, and, excluding the west coast, the warmest part of Canada in winter is the *Lake Peninsula of Ontario*, between Lake Huron on the one side and Lakes Erie and Ontario on the other. This not only lies farther south than any other part of Canada, but is also most subject to the moderating influence of the Great Lakes.

From the Lakes eastward, the temperature again drops and the winters are again severe, the St. Lawrence being frozen over and navigation usually being suspended from November to April. Also, from the end of December to March, the Great Lakes themselves are frozen for a distance of about a mile from the shore, and, consequently, are at this period both inaccessible from the ocean and useless for navigation.

The severity of the winter on the east coast is due mainly to the fact that winds blow off-shore from the frozen interior of the continent. In addition, however, there is the effect of the cold Labrador Current, which flows southward past the St. Lawrence from Davis Strait. This current carries along great volumes of Arctic water and great masses of ice, and in summer, particularly, its cooling effect is markedly evident in the cool sea breezes which blow up the valley of the St. Lawrence. The meeting of the waters of the Gulf Stream with this cold current causes fogs in the Gulf of St. Lawrence and off the coast of Newfoundland.

In summer, British Columbia again affords a contrast to the interior, for the coastal region to the west of the Rockies is then comparatively cool. At this time of the year the warmest part of Canada is to the east of Alberta, the average temperatures from here towards the east coast ranging between 60° and 70°, with a tendency to increase towards the south-east. But for the cooling effect of the Great Lakes and of the Atlantic Ocean, the centre and south-east of Canada would doubtless be much hotter at this period than they actually are.

Rainfall. The close relationship of rainfall to relief is plainly indicated in Canada. By far the heaviest rainfall is experienced on the windward slopes of the western coastal ranges, which have an abundant rainfall at all seasons and especially the coast region of British Columbia to the west of the Rockies, where the west of Vancouver Island, for example, gets more than 100 inches in the year (Fig. 188).

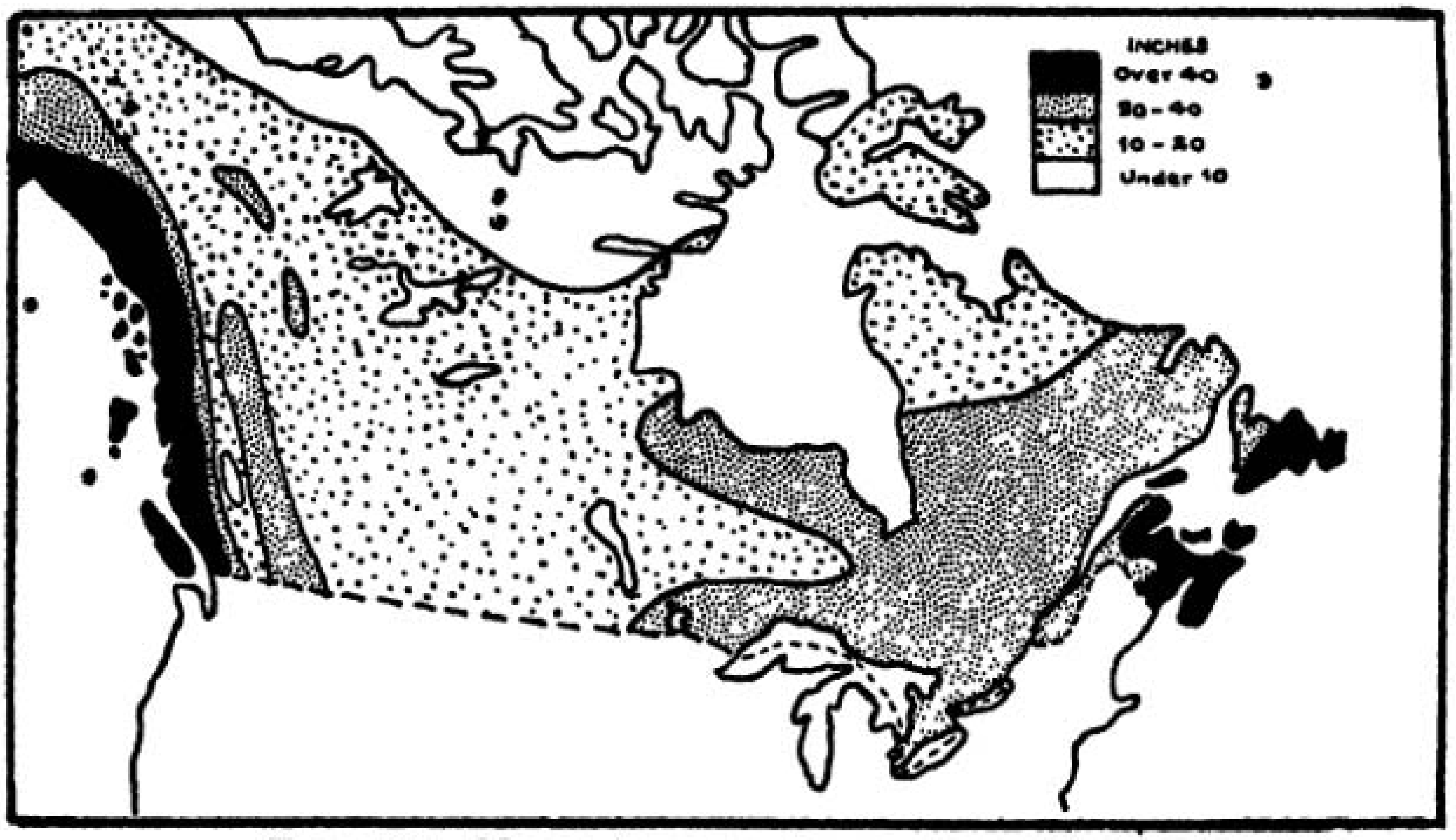


Fig. 188: Mean Annual Rainfall of Canada.

In parts of the interior of British Columbia, however, where the rain is not "trapped" by relief, the rainfall is low, and irrigation is required for agriculture.

On the Rockies, the rainfall is fairly abundant in spite of their distance from the sea, but eastward, on the great plains, in the rain-shadow of the mountains, the amount of precipitation is small and decreases gradually towards the interior, as little as 10 inches falling in south Saskatchewan, and this mostly in summer. From here to the east coast, the rainfall gradually increases again, until, on the Atlantic coast and east of the Great Lakes, it reaches between 40 and 60 inches per annum, brought chiefly in summer by cyclonic storms which are attracted overland by the heated interior. The considerable precipitation which is received in this region during the winter months—as indeed everywhere in Canada except in coastal British Columbia—takes the form of snow.

In southern Saskatchewan, the mean annual snowfall is about 2½ feet (equivalent to about 2½ inches of rain), and the amount increases rapidly towards the east. On the eastern shores of the Lakes it is especially heavy, 17 feet in some places, while in most parts of the Gulf of St. Lawrence region it exceeds 8 feet.

Natural Regions of Canada

The physical features and climate of Canada naturally combine in their effect on the distribution of vegetation and animals, and the country may be broadly divided into five natural regions, *viz.*: (1) the Tundra, (2) the Coniferous Forest Region, (3) the Pacific Forest Region, (4) the Atlantic Forest Region and (5) the Temperate Grasslands.

THE TUNDRA lies chiefly within the Arctic Circle. Its main characteristics have already been described in our consideration of the broad natural regions of the world (see Chapter 9).

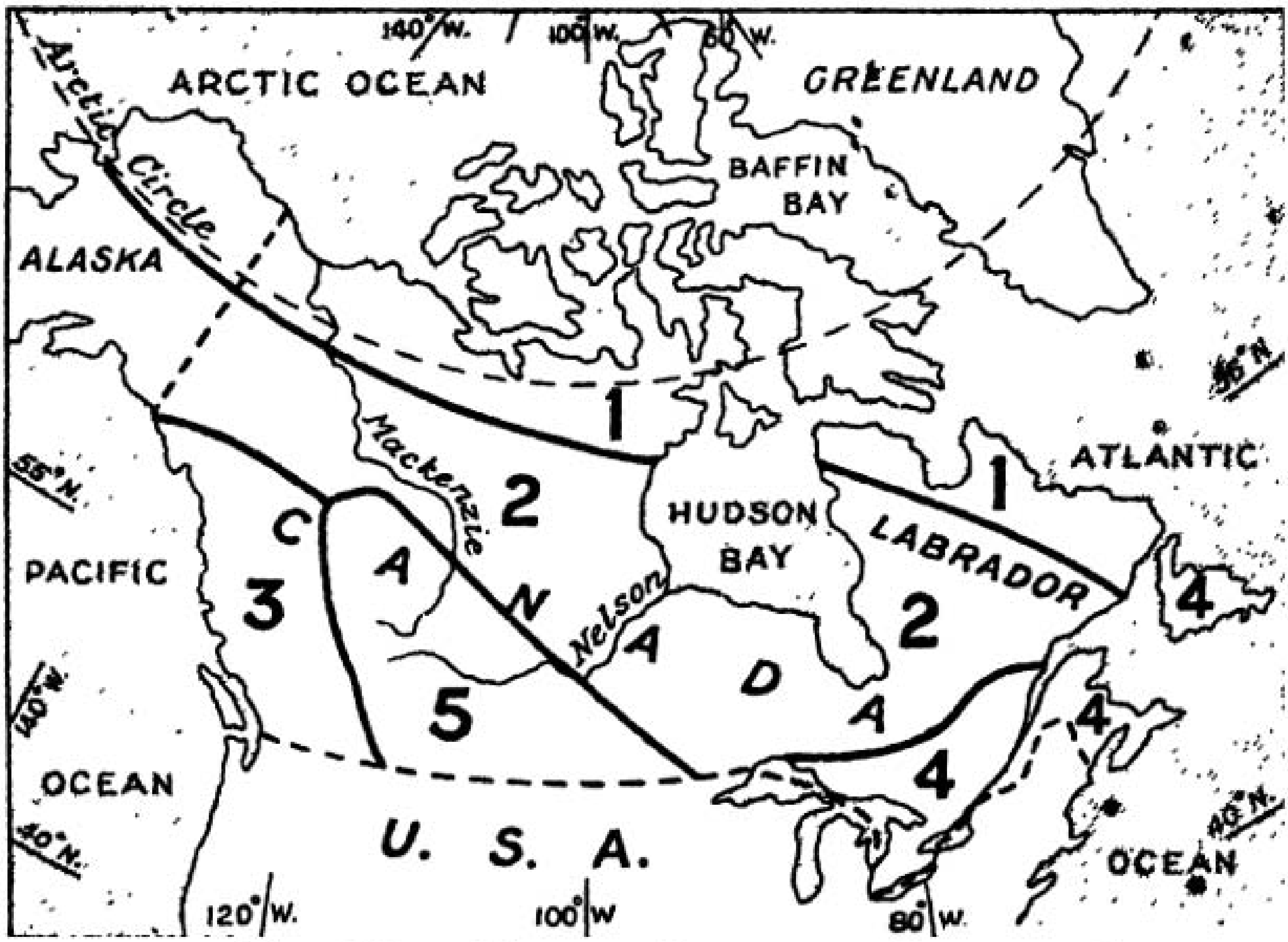


FIG. 188A. NATURAL REGIONS OF CANADA.

THE CONIFEROUS FOREST REGION lies immediately south of the Tundra and stretches from the Atlantic to the Pacific. In this region, the winters are long and bitter and the summers short. The precipitation is small, and broad-leaved trees are therefore relatively rare. The predominant trees are conifers, such as pines, firs, hemlocks, spruces and larches, although one broad-leaved but hardy tree, the birch, is present in considerable numbers.

Canada's coniferous forests are the natural home of many small fur-bearing animals, such as beavers, hares, minks, martens, skunks, squirrels and musk rats, and also of numerous larger animals, such as moose, caribou, bears, wolves and foxes.

THE PACIFIC FOREST REGION comprises the forests of British Columbia, which extend from the coast inland to the Rockies. The mild and wet climate is particularly favourable to tree growth, and such trees as the Douglas fir, the Sitka spruce, the hemlock and the western red cedar grow in large numbers and to enormous size on the coastal plains. In the interior, yellow pine, larch and fir predominate. Of the many animals found in the forests of this region may be mentioned the bear, antelope and mountain sheep.

THE ATLANTIC FOREST REGION covers much of Quebec south of the coniferous forests, as well as Ontario and New Brunswick. Mixed forests of coniferous and deciduous trees are found here, the former predominating in the north, where pines, firs, spruces and larches are most numerous, and the latter in the south, where oaks, elms, maples, poplars and other hardwoods predominate. Fur-bearing animals, such as the beaver and squirrel, abound.

In both the Atlantic and the Pacific forest regions much of the timber has been cut down in connection with the lumbering industry, and, in the south, a great deal of the land has been cleared for agriculture.

THE TEMPERATE GRASSLANDS are situated south of the forest region and stretch from the Rockies to the Great Lakes. Generally, the climate is one of hot summers, bitterly cold winters and little precipitation. Here trees, though not entirely absent, are relatively scarce, and the great grassy plains at one time formed the home of great herds of bison. Only in the extreme north of the region are they now found, since the greater part has been settled and is extensively cultivated, chiefly for the growth of wheat.

Agriculture

Crop-raising is easily the most important industry of Canada, and agricultural products form almost half the total exports. The vast stretches of fertile soil in the prairie lands and the climatic conditions have proved eminently suitable to the growth of cereals. The winter cold assists in breaking up the soil and the hot, dry summers give perfect ripening conditions. In addition, the level nature of the surface permits the use of large, labour-saving machinery and has encouraged railway development.

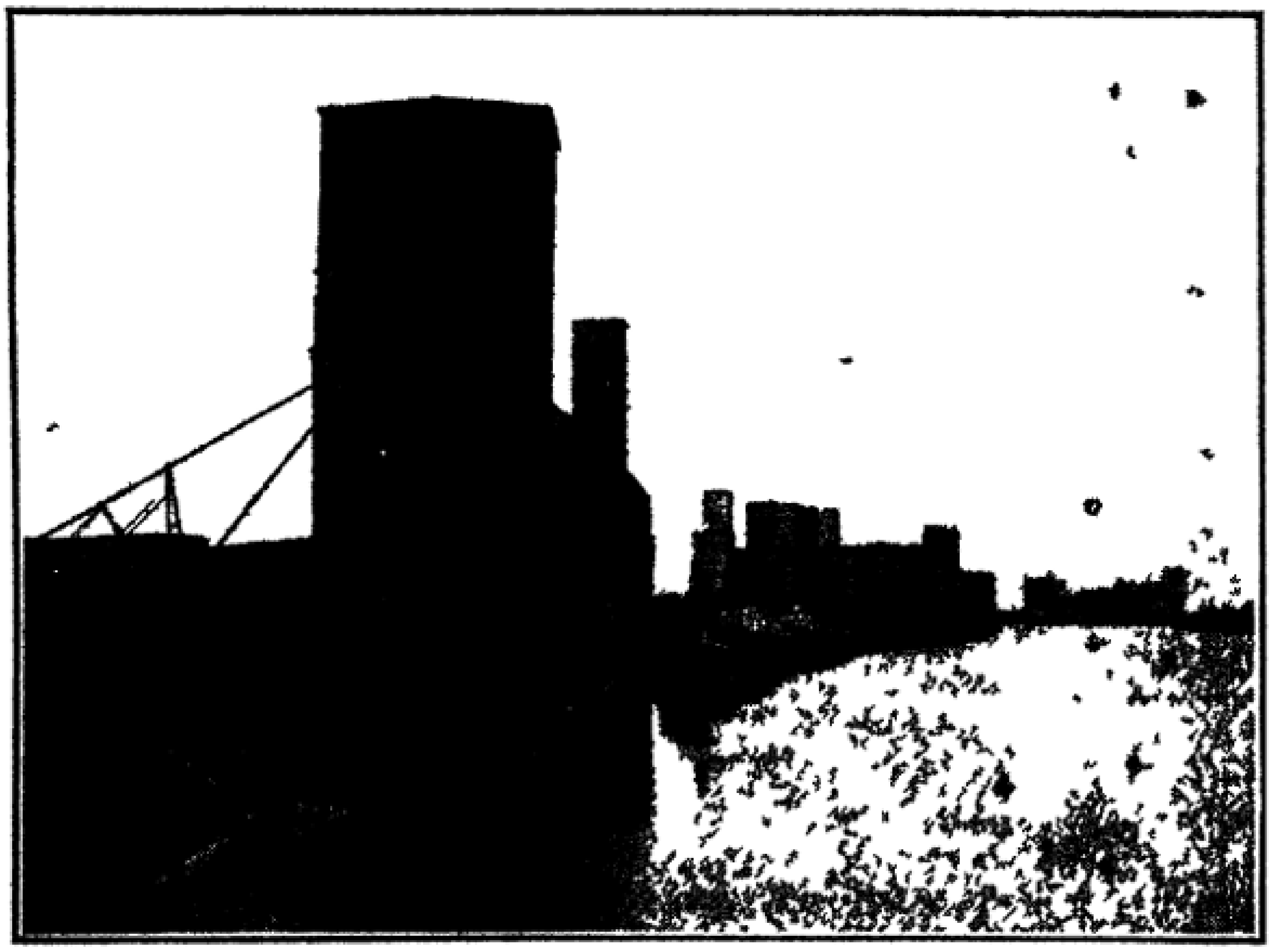
CEREALS. *Wheat* is by far the most important crop. For many years the wheat crop was the sole product of the prairies, but mixed farming is becoming increasingly important and other crops are grown in rotation with wheat so as to prevent the exhaustion of the soil.

The wheat grown in Canada is of two varieties—" winter wheat ", which has the larger yield per acre and is sown in autumn and reaped the following summer; and " spring wheat ", which is much more common, and is sown in the spring and harvested in the autumn.

Spring wheat is characteristic of Saskatchewan, Alberta and Manitoba, the three great wheat-producing provinces. Winter wheat can be grown only where the winter is not too severe or where snow falls before frost comes, and is consequently confined to Ontario, British Columbia and those parts of Alberta which are influenced by the Chinook winds.

Canada is the most important wheat-exporting country in the world, most of its output going eastwards *via* the routes to the Atlantic coast, as shown in Fig. 189. The main ports of export on the Atlantic coast are Montreal, St. John and Halifax in Canada. Formerly, much Canadian wheat was exported through the Atlantic ports of the United States, but since the Ottawa Conference this export has declined considerably, mainly because, in order to qualify for Empire preference, Empire wheat must be exported through Empire ports. The wheat of the western prairies is exported through Vancouver and is shipped to Europe *via* the Panama Canal. With the development of the Hudson Bay route, the east and west coast ports are likely to lose a considerable part of the wheat export trade.

Before the wheat is sent abroad it is usually subjected to careful inspection and is graded before being stored in "elevators"—vast storage warehouses, built alongside the railways or at the quayside.



[*By courtesy of Canadian National Railways.*

HUGE GRAIN ELEVATORS AT FORT WILLIAM, ONTARIO.

The grain is loaded and unloaded in bulk by mechanical means (suction or conveyors), and the method of handling affords an interesting contrast to that of Australia, where sacks are largely used.

The Canadian system of "bulk-handling" wheat is in direct contrast to the Australian system of handling the wheat in sacks. There are over 4,000 elevators in Canada, and they are conspicuous objects at nearly every railway station in the prairie provinces, as well as at many ports of shipment.

The Canadian wheat farmers suffer from one great disadvantage in the irregular occurrence of droughts, as a result of which they are tending to move to the rather wetter areas north of the present main wheat belt, *e.g.*, to the *Peace River* district.

Oats, Canada's second most important crop, are grown in Saskatchewan, Ontario, Alberta, Quebec and Manitoba. They occupy about half the acreage under wheat and are grown mainly as cattle fodder but are used also for the production of breakfast foods.

Barley is grown mainly in Saskatchewan, Manitoba and Alberta; and *maize* almost solely in Southern Ontario.

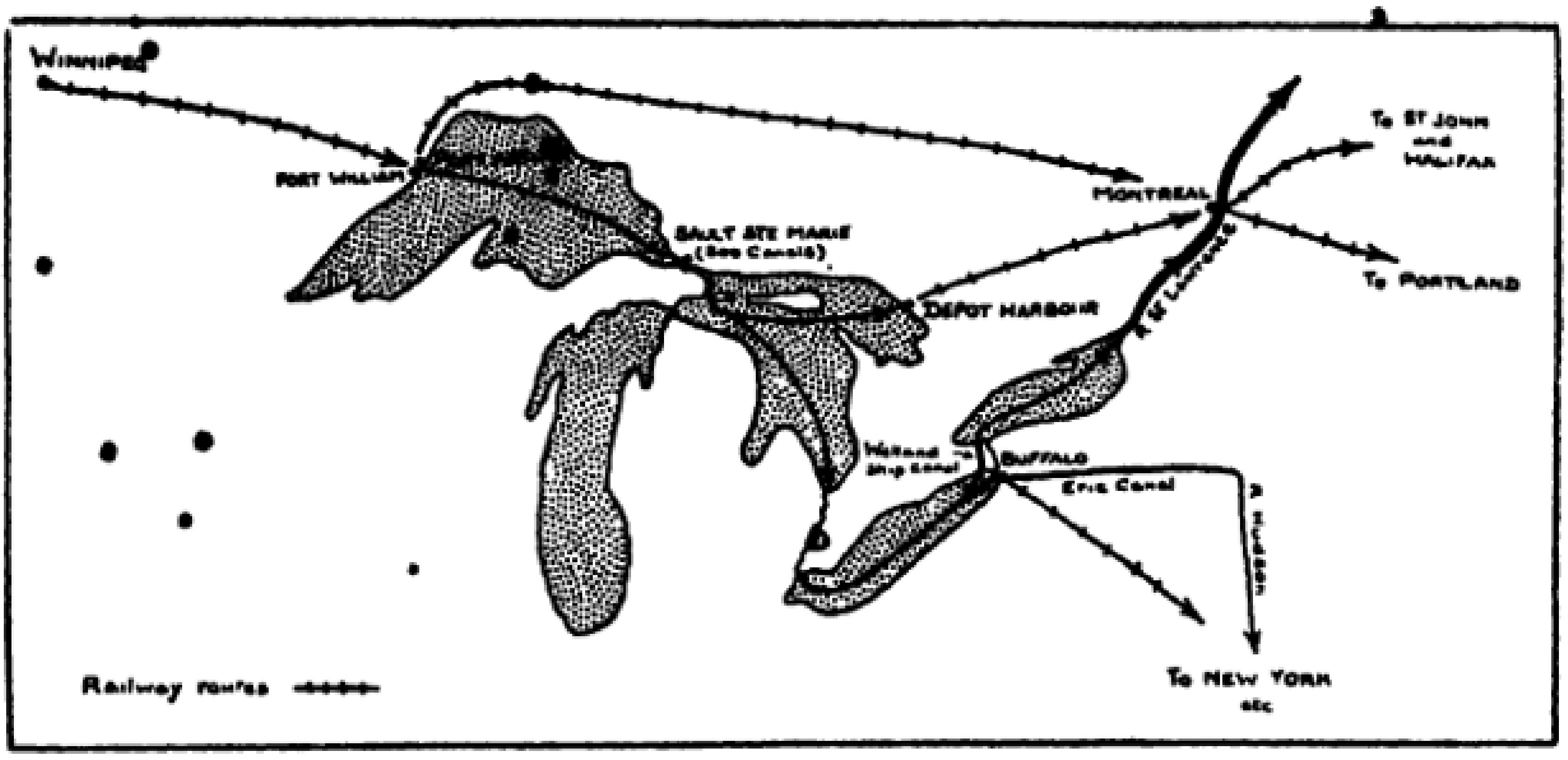


FIG. 189: ATLANTIC OUTLETS FOR CANADIAN GRAIN.

FRUIT is one of Canada's most important crops, supplying a large and growing canning industry, as well as a considerable export trade. There are three important areas of production: (1) the Lake Peninsula of Ontario; (2) British Columbia; and (3) the Annapolis Valley and Middle Basin of Nova Scotia.

The Lake Peninsula of Ontario has the advantages that it not only lies in the same latitude as northern Spain and the south of France, but also that it is subject to the tempering influence of the Great Lakes, which prolongs the autumn and so saves the crops from being injured by frost. Further, the cold, sunny winters of this region have a beneficial influence in destroying insect pests. Considerable quantities of apples, pears, plums, cherries, grapes and small fruits are grown.

British Columbia has many sheltered valleys, notably the Okanagan Valley, which are very favourable to fruit-farming, and this, with the aid of irrigation where necessary, is becoming increasingly important.

Apples, pears, plums, cherries, peaches and grapes are the leading fruits. Much of the fruit is canned for export at New Westminster.

The Annapolis Valley and *Minas Basin* of Nova Scotia have a more severe climate and so produce the hardier varieties of fruits. Apples, especially, are grown in large quantities.

Other Crops. *Flax* is grown for seed mainly in Saskatchewan; *tobacco* in the Lake Peninsula; *sugar-beet* in Alberta and Ontario; *hay*, *clover*, *potatoes* and *fodder corn* in Quebec and Ontario.

Pastoral Industries are still of great importance throughout Canada, despite the fact that more and more land is being given over to crops. *Beef cattle* are reared in large numbers in Alberta and Saskatchewan, where the warming effect of the Chinook winds enables the cattle to be kept in the open throughout the year. There is an abundant supply of fine nutritive grass which, turning to hay as it grows by the heat of the late summer and early autumn, provides an adequate food supply all the year round. There is a surplus of beef available for export, the animals being sent to Montreal for slaughter, whilst live beasts also are exported.

In the eastern provinces, particularly Ontario and Quebec, cattle are reared in large numbers for the provision of *dairy produce*, especially cheese and butter, which are important exports. Here the pastures are much richer than those of the prairies, but the cold winters make it necessary to house the cattle in winter. The increase in mechanical transport has led to a diminution in the number of horses. Ontario and Quebec rear about 60 per cent. of Canada's sheep, though sheep rearing on a large scale is not practised in the Dominion owing to the severity of the winter climate.

Forestry

Lumbering, with its associated industries, is one of the leading industries of Canada, the most important lumbering provinces being British Columbia, Ontario, Quebec and New Brunswick. As the trees are mainly conifers (consisting largely of Douglas fir, spruce and white pine), timber and pulpwood are the chief forest products, and Canada is now the largest exporter and second largest producer in the world of woodpulp and paper.

The timber is drawn over the frozen marshes and snow in winter and floated down the rivers to the sawmills in the spring. The sawmills are usually situated where abundant water-power is available from adjacent falls and where facilities exist for the transport of the sawn timber. Ottawa (Ontario) and St. John (New Brunswick) are the leading saw-mill and timber centres. Broad-leaved trees, or hardwoods, are not nearly so abundant as the soft-woods. (See Chapters 13 and 14.)

Furs also constitute an important forest product.

Mining

The mineral resources of Canada are extensive but by no means fully developed. The Dominion stands first in the world as a producer of asbestos, cobalt and nickel; second as a producer of gold; third as a producer of silver; fourth as a producer of copper and lead; and fifth as a producer of zinc.

Asbestos is mined in south-western Quebec; *cobalt* is a by-product of silver-mining and is obtained from Ontario; whilst the *nickel* output is obtained entirely from Sudbury in Ontario.

Coal is found in (1) Nova Scotia and New Brunswick in the east; (2) Alberta and Saskatchewan; (3) British Columbia (Crow's Nest Pass); (4) Vancouver Island and Queen Charlotte Islands on the Pacific Coast; and (5) the Yukon. The situation of the fields is shown on Fig. 107.

Ontario and Quebec, the industrialised and most populous provinces, are without coal, except for recently discovered deposits of lignite, and they consequently have to import their requirements from the nearby fields of the United States. The western fields of Canada, on the other hand, export coal to the west of the United States. The coal of Nova Scotia is of excellent quality. It is mined around Sydney (Cape Breton Island) which exports to the New England States of the United States, the St. Lawrence ports and Newfoundland.

Alberta and Nova Scotia are the leading coal-producing Provinces, followed by British Columbia. Saskatchewan also is a producer and there is a small output from New Brunswick. The coal of Alberta and Saskatchewan is not of good quality. The advent of the railway opened up the Fernie and Kootenay districts of the Rockies. On Vancouver Island, Nanaimo is the chief centre. Some anthracite is found on the Queen Charlotte Islands.

Although the coal reserves of Canada are enormous, they have been worked as yet only where the fields have bordered the coast or where railways run across them. As with the mineral resources generally, the development of the coal resources is dependent on the extension of transport facilities, but is influenced also by economic considerations, *e.g.*, it is cheaper for Ontario and Quebec to import coal *via* the Lakes from the United States than to obtain it by rail from the prairie provinces.

Gold. Canada is one of the few countries where the mining of gold is increasing in importance. The Kirkland Lake and Porcupine districts of Ontario produce over 80 per cent. of the output; British Columbia produces 8 per cent., Quebec 6 per cent., and the Yukon 2 per cent. Rossland and Nelson are the leading gold centres in British Columbia.

The greater part of the gold production of both British Columbia and Quebec is recovered as a by-product in the treatment of sulphide ores.

Copper is obtained chiefly from British Columbia, which produces over one-half of the Canadian output. The centres are Britannia Bay a few miles north of Vancouver; Copper Mountain, near Princeton; and the Hidden Creek mine of Anyox. There are also large deposits at Sudbury in Ontario and in western Quebec.

Lead and *zinc* are most important in the Kimberley district of British Columbia, though high grade lead is mined also near Galetta (Ontario).

Silver is obtained mainly from the Kimberley and Portland Canal districts of British Columbia, and from Cobalt in Ontario. (See Chap. 13).

Petroleum is found in small quantities in Alberta (Turner Valley), Ontario and New Brunswick, and the output shows a steady increase.

Fishing

Canada's fisheries, which are regarded as the third most important in the world, fall into three divisions: (1) the ATLANTIC FISHERIES. (2) the PACIFIC FISHERIES and (3) the LAKE FISHERIES.

THE ATLANTIC FISHERIES are of two classes—the coastal fisheries and the deep-sea fisheries. The coastal fisheries are by far the most important, the whole shore line having innumerable well-sheltered inlets which afford splendid facilities for carrying on fishing operations. The deep-sea fisheries extend over the shallow "banks" lying between the outer limit of the inshore fishery and the deep waters of the Atlantic and include the Grand Banks of Newfoundland.

Cod is the most important fish of the Atlantic, but haddock, hake, halibut, herring, mackerel, salmon and other fish also are caught in large quantities. In addition, the shores of the Atlantic provinces constitute the richest and most extensive lobster fishing grounds in the world, giving rise to an important lobster-canning industry.

THE PACIFIC FISHERIES contribute about 40 per cent. of the total produce of the Canadian fisheries. Salmon is by far the most important fishery of this region, yielding over 75 per cent. by value of the total fish caught. Every spring, enormous numbers of salmon ascend the rivers and coastal inlets from the sea to spawn and they are caught in great quantities in such rivers as the Fraser and the Skeena and in such openings as Rivers Inlet. Large numbers of salmon are also taken in the open sea. The greater portion of the salmon catch is tinned for export.

Halibut also is of great importance, mainly off the west coast of Vancouver Island and Queen Charlotte Islands, whilst herrings are abundant, especially in the Barkley Sound region, on the west coast of Vancouver Island and in the Nanaimo district of the east coast of the island.

THE LAKE FISHERIES, including the Great Lakes, and lakes Alberta, Saskatchewan and Manitoba, all are prolific in yield. The principal fish caught are fresh-water herring, perch, pike, pickerel, sturgeon, trout, carp and whitefish.

Manufactures

The sparsity of Canada's population and the great attraction of the food-producing industries have retarded the development of her manufactures. In more recent years, however, Canada has made rapid progress in the development of manufacturing industries on a large scale, this development having been greatly assisted by an abundant supply of water-power (see page 128). Today, Canada is the leading manufacturing country of the British Empire overseas.

There are extensive flour-milling and meat-packing industries, while the preparation of dairy produce, fruit preserving, fish canning and sugar-refining are all of increasing importance. Next to the food products come those industries which utilise wood and wood-products, Canada now being the greatest manufacturer of news-paper in the world. Allied to these, are a variety of chemical industries, such as paint, varnish and matches. The manufacture of agricultural machinery and motor-cars also is becoming very important. Naturally, the chief industrial region is that which has the raw materials and which can most easily supply the markets. This is the case in Quebec and Ontario, where both raw materials and power are found in plenty or are easily obtainable, while extensive and easily-reached markets are available in these populous provinces, as well as in the highly industrialised neighbouring districts of the United States.

Commerce

The principal Canadian *exports* are wheat and wheat flour (30 per cent. of the total) and forest products, chiefly newsprint and pulp (20 per cent. of the total). Others include fish, copper, furs, whiskey, cheese, fruit, nickel, meat and motor-cars. The *imports* consist mainly of iron and steel manufactures, textiles, petroleum, coal, chemicals, wines, tropical fruits and sugar.

The greater part of the trade is with the United States, followed by the United Kingdom.

Communications

Canada is particularly fortunate in being well supplied with natural means of communication. The Great Lakes and their connections provide the world's greatest *inland waterway* (see Chapter 19), a feature which has contributed in no small degree to the rapid development of the bordering areas. Apart from this, however, several important transcontinental *railways* have been constructed as already described in Chapter 18, whilst *air transport* is developing (see Chapter 19).

PROVINCES AND TOWNS

Nova Scotia

Nova Scotia is a remarkably shaped peninsula, almost surrounded by water, lying in the extreme south-east of Canada. The province, which includes Cape Breton Island, is rich in coal, and the cool, moist climate provides excellent pastures for dairy cattle. Fishing, lumbering and shipbuilding are important industries, whilst the Annapolis Valley is noted for its apple orchards. The population is about 512,000.

Halifax, on the Atlantic coast, is the capital and an important trans-Atlantic port. As it has a fine ice-free harbour, it is an important winter outlet of Canada (especially for wheat) when the St. Lawrence is frozen over, and is the terminus of the Canadian National Railway.

Sydney, on Cape Breton Island, also is an important ice-free port, as well as being the most important iron and steel centre in the Dominion. Coal is found locally, but both the ore itself and fluxes (chiefly limestone) are imported from Newfoundland.

Prince Edward Island

Prince Edward Island is situated at the mouth of the Gulf of St. Lawrence between Nova Scotia and New Brunswick, from which it is separated by Northumberland Strait. It is the smallest of the Canadian provinces, and engages mainly in agriculture, fishing and fur-ranching. The breeding of silver foxes on farms is an important industry. The furs are exported to the United States and Europe, whilst breeding-foxes also are exported. The oyster beds of Richmond Bay are becoming of increasing importance. At present lobsters are the most important fish caught. The population is 88,000.

The capital, *Charlottetown*, has a pork-packing industry and exports fish, potatoes and grain.

New Brunswick

This Province, situated between the St. Lawrence, Nova Scotia and Maine (U.S.A.), is a richly forested area. The main industries are lumbering, fishing, agriculture, mining and shipbuilding. The forest products include sawn timber, pulp and paper. The mineral wealth is considerable, but only coal, copper, antimony and gypsum are mined in any quantity. Oats are the chief cereal, while the canning of lobsters and sardines is an important industry. The population is 408,000.

Fredericton, the capital, is situated on St. John River and is an important lumbering centre.

St. John, the largest town, has a fine harbour on the Bay of Fundy, and is a terminus of the Canadian Pacific Railway. As its harbour is always open, St. John has a large foreign trade, exporting mainly furs, fish, timber, livestock and dairy produce. The industries include saw mills, paper-mills and textile factories.

Quebec

Quebec is a large province stretching from Hudson Strait to the United States boundary, and including the lower basin of the St. Lawrence. Much of the land is still unexploited. Lumbering, agriculture and mining are the main industries. Fodder, corn, oats and potatoes are the leading agricultural products, while dairying is extremely important, the province having about one million milch cows. Quebec is the principal pulpwood province in the Dominion, producing over half the Canadian output.

Of minerals, the province produces 65 per cent. of the world's asbestos, and copper and gold also are important. The fisheries provide cod, mackerel, lobsters, salmon and herring, while furs from wild animals and from animals reared in captivity for the purpose form a valuable product. The population is nearly 3 millions.

Quebec, the capital, is situated at the head of the St. Lawrence estuary. The port has a fine, deep harbour, but, in common with the other St. Lawrence ports, is closed to navigation in winter. It is one of the most important industrial centres in the Dominion, power being provided by the adjacent Montmorency Falls. The chief manufactures are iron and steel goods, textiles, leather, boots, shoes, paper and tobacco.

Montreal is the most important town, and is also the "commercial capital," the principal port and largest town of Canada (see p. 225 and Fig. 134).

Ontario

Ontario, stretching from Hudson Bay to the Great Lakes, and from Quebec to Manitoba, includes the important Lake Peninsula. Much of the northern part is unexploited. In the southern area around the lakes the important industries are agriculture (oats, wheat, barley, potatoes, fodder); dairy farming (milch cows number over 1 million); fruit farming; lumbering; mining (gold, silver, nickel, copper); and miscellaneous manufacturing industries. The population is 3,426,000.

Toronto, the capital, is situated on Lake Ontario. It has an excellent harbour and is an important Lake port, with a large trade in lumber, grain, dairy products, fruits, cattle and coal. It is also a railway and manufacturing centre, with saw-mills, flour-mills, breweries, distilleries, foundries and paper and furniture factories.

Ottawa, situated on the River Ottawa, west of Montreal, is the capital of the Dominion, and has saw mills, flour mills, paper factories and numerous other industries based partly on the power from the Chaudière Falls.

Sudbury, just north of Lake Huron, is an important copper and nickel centre.

Saulte St. Marie, situated on the important "Soo" canals of Lake Superior, has large pulpmills as well as important iron and steel works. It derives its supplies of power from the rapids of the St. Mary's River.

Hamilton, to the west of Lake Ontario, is an industrial town engaged in the manufacture of iron, steel, textiles and agricultural implements.

Port Arthur and *Fort William* are the great grain ports situated on the north-western shore of Lake Superior. Shipbuilding and iron-smelting are important industries.

London, at the junction of the two branches of the River Thames, is an industrial centre with petroleum refineries, iron foundries, textile mills, tanneries and railway repair shops.

Kingston, at the eastern end of Lake Ontario, is an important Lake port controlling the traffic passing through the Rideau Canal from and to Ottawa. It is a prominent manufacturing centre, including among its productions ships, locomotives, machinery, boots, shoes and agricultural implements.

Manitoba

Manitoba, west of Ontario, is mainly an agricultural province, and includes the fertile Red Basin (*cf.* the Red Basin of Sechwan in China). Barley, wheat and oats are the leading cereals, wheat being the chief export crop. Mixed farming and mining are both increasing in importance, while the lakes provide large quantities of excellent fish. The population is 700,000.

Winnipeg (see p. 226 and Fig. 135) is the capital. *Brandon*, west of Winnipeg, is a wheat-growing centre with numerous flour mills. It also makes agricultural implements.

Saskatchewan

Saskatchewan, situated between Manitoba and Alberta, is Canada's most important wheat-producing province, and has, in addition, a large cattle-rearing industry. Barley, oats, rye and flax for seed also are cultivated. Coal is mined, Saskatchewan ranking fourth in importance among Canada's coal-producing provinces. The population is nearly 1 million.

Regina, the capital, situated 350 miles west of Winnipeg, is an important distributing centre and a great cattle market. Its industries include flour milling and tanning.

Alberta

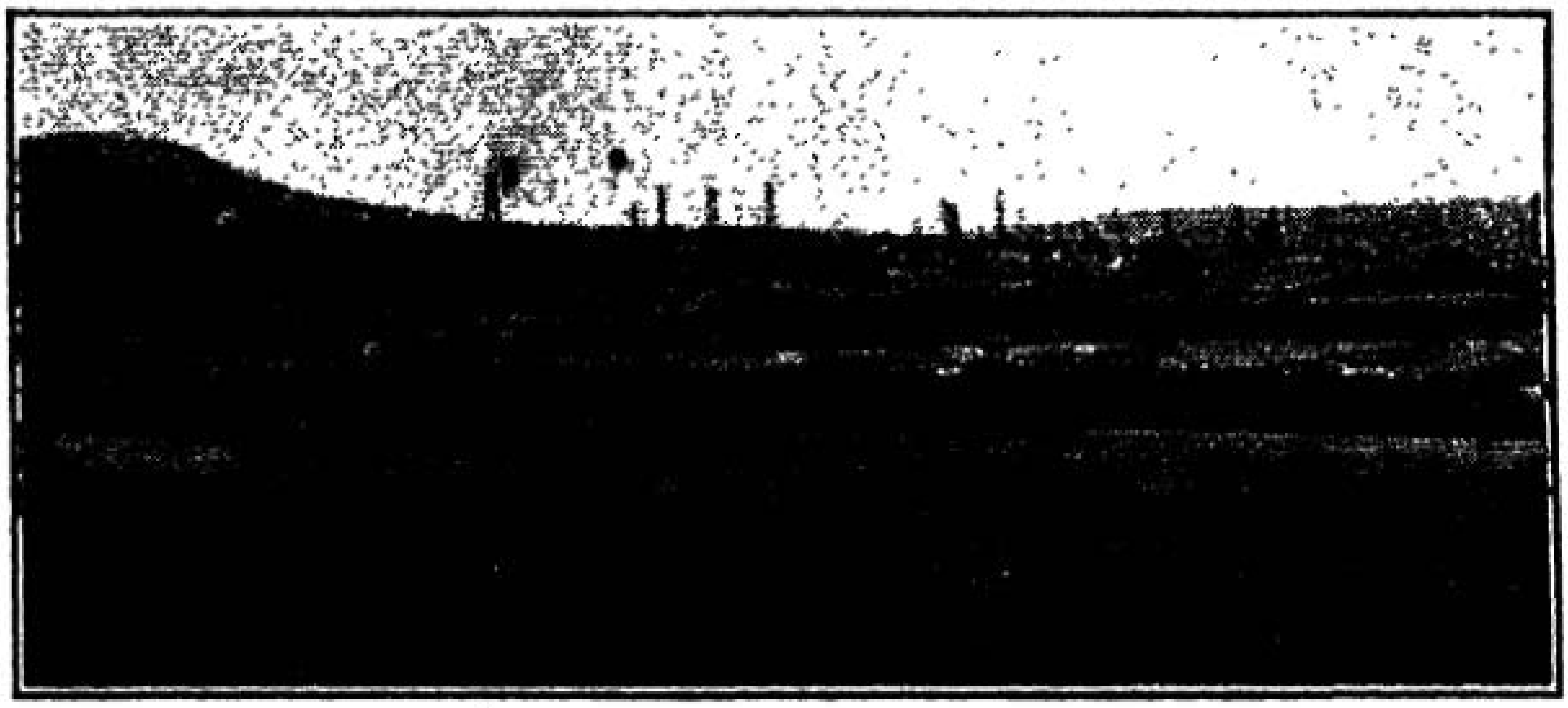
Alberta, lying west of Saskatchewan and to the east of the Rockies, is important for the production of cereals and the rearing of beef cattle, whilst it has much latent mineral wealth. Wheat is the leading cereal, followed by oats and barley. Alberta is one of the principal coal-producing provinces of Canada, having an annual production of about 5 million tons. Natural gas also is abundant and petroleum is found. The population is 728,000.

Edmonton, the capital, is situated on the North Saskatchewan River in a rich coal-mining and agricultural region, while it lies south of an important natural gas area. It is the centre for the fur trade of the Mackenzie Basin.

Calgary, to the south, in a large ranching district, is an important cattle market.

Medicine Hat, on the South Saskatchewan River, is the centre of a natural gas producing district and is a growing manufacturing town, with important railway works.

Lethbridge is the chief coal mining centre.



[*By courtesy of Canadian National Railways.*

A VALLEY OF OIL FIELDS IN ALBERTA.

The numerous derricks indicate how closely work and wealth may follow the discovery of oil supplies.

British Columbia

British Columbia, the Pacific Maritime province, situated between the Rockies and the Pacific Ocean, includes VANCOUVER ISLAND, QUEEN CHARLOTTE ISLANDS and many small islands off the coast. The forest areas are extensive. Lumbering (sawn timber and pulp wood), mining (coal, gold, copper, zinc, silver and lead), fruit growing, farming and fishing are important industries. Of these, the products of the lumbering industry have the greatest value. The population is about 750,000.

Victoria, the capital, situated on a splendid harbour on Vancouver Island, is a naval station, a fishing centre and a manufacturing city.

Vancouver (see p. 227 and Fig. 136) has an ideal situation on the coast of the mainland, and is the largest port on the Pacific coast of the Americas.

New Westminster is a growing port on the Fraser River, exporting timber, minerals, salmon, apples and paper. It has numerous industries, including salmon and fruit-canning, lumbering and paper making.

Prince Rupert, near the mouth of the Skeena River, is a terminus of the Canadian National Railways. It has a fine harbour but is not important in foreign trade. There is a large salmon-canning industry.

Rossland, in the south, is the centre of a great mining district.

Nanaimo is an important coal port on the east coast of Vancouver Island.

The Yukon and the North-West Territories

These Territories have a severe climate and are scantily populated. Furs are the principal product of the North-West Territories, while gold, coal, silver and furs constitute the staple products of the Yukon. The population of the Yukon, now 4,230, has decreased with the decline in gold production. The North-West Territories have a population of 9,700, mainly Eskimos and Indians.

Dawson, the capital of the Yukon, is the principal town and the chief mining centre.

NEWFOUNDLAND

Area : 42,734 sq. miles ; *Population :* 282,000.

Newfoundland, the oldest British colony, but now a Dominion, is situated at the mouth of the Gulf of St. Lawrence. It is separated from its great dependency of Labrador by the narrow Belle Isle Strait. There is very little land below six hundred feet high and the coastline is deeply indented. The winters are cold and long, with heavy falls of snow, and the summers are cool and damp, but the climate is a little less extreme than that of the adjacent mainland. Much of the island is covered with marsh and moorland, whilst rivers and lakes are numerous. Many parts are heavily timbered, though large areas of the forest land are thin and poor.

The chief occupation is fishing, for on the *Grand Banks* is the most productive cod-fishery in the world. Other fish caught include salmon, halibut, lobster, caplin and seal. The products of the fisheries form one of the most important exports, and the industry gives employment to about 25 per cent. of the population.

The interior, however, is rapidly attracting capital, and the vast timber resources of the well-wooded areas are being exploited for the production of wood-pulp, with the aid of the plentiful water-power available. *Grand Falls, Bishop's Falls, Lomond, Corner Brook* and *Alexander Bay* have large paper and pulp mills, paper and wood pulp now forming a large percentage of the total exports.

The island is also rich in mineral wealth. Iron is important, particularly in Bell Island (in Conception Bay on the east coast), and is exported to Sydney and to Europe (especially Holland and Germany). Copper (Notre Dame Bay), lead and coal are also found. Agriculture is relatively unimportant.

The only town of note is *St. John's*, the capital, in the Avalon Peninsula on the south-east coast. It has a fine ice-free harbour and is a port of call for ships from Canada, Britain and the United States. It has railway connection with *Port-aux-Basques* in the south-west, whence there is a frequent steamer service to Sydney (Nova Scotia).

The principal *exports* of Newfoundland are pulp and paper (about 60 per cent. of the total); dried cod and other fish products (about 25 per cent.); and iron ore (about 13 per cent.). The leading *imports* are flour, coal, machinery and textiles.

The greater part of the trade is with Canada, the United States and Britain.

LABRADOR, Newfoundland's great dependency on the mainland, has long, severe winters and short, warm summers. The people are mainly Eskimos and, on account of the severe climatic conditions, the chief occupations are fishing and trapping. There is much mineral wealth (particularly iron and mica), large areas of forest land and an abundance of available water-power all awaiting development. A railway from Hamilton Inlet to Quebec is projected.

THE UNITED STATES OF AMERICA

Area : 3,738,395 sq. miles ; *Population :* 123,000,000.

The Republic of the United States of America stretches from the southern boundary of Canada to Mexico, and occupies the greater part of southern North America. Included in the republic are forty-eight States and the non-contiguous territories of ALASKA, HAWAII, PORTO RICO, the PHILIPPINE ISLANDS, the VIRGIN ISLANDS, AMERICAN SAMOA and GUAM.

Relief and Climate.

The relief and climate of the United States have already been discussed in preceding pages. Additional details respecting the climate are given below in the description of the natural regions.

Industries

The United States make a nearer approach than any other country in the world to being adequately supplied from their own resources with every need of modern civilisation. With a few exceptions (such as rubber, silk and tin) the vast population of this wonderful country has at hand all that it needs to feed itself, clothe itself and provide itself with most of the amenities of life. This remarkable self-sufficiency has not only greatly assisted the development of the nation, but has also had a marked influence on the policy of its statesmen.

Fortunately for the rest of the world, and particularly for the older countries such as France, the United States cannot provide themselves with many refinements of life such as only the older civilisations can produce. Europe still supplies the States not only with artistic work but also with many of the more delicate and choice articles. France, for instance, finds a ready market in that country for her gloves and gowns; Italy for her silks and England for her woollens, linen and crystal glass.

Forestry and Fishing

FORESTS. There are nearly 500 million acres of forest in the United States. The most important forest areas are the uplands of the

Alleghenies in the east and the western coastal highlands, in both of which districts many varieties of wood are found—the softer conifers in the north and the harder woods in hotter districts.

The chief commercial tree is the yellow pine of the south-east, which yields resin from which turpentine is distilled, and is widely used for shipbuilding and furniture making. Next in importance is the Douglas fir of the vast forests of the north-west Pacific region. Other trees of commercial importance are the white pine of the north-east and the hardwoods (mainly oak, but also chestnut, walnut, and maple) of the east-central States. About one-third of the total forest area is under the United States Forest Service. Great attention is given to afforestation, for it is estimated that at present timber is being planted at only one-quarter the rate at which standing timber is being cut. The production of wood-pulp is quite inadequate, imports being obtained from Canada. (See Chapter 14.)

Fishing is of even greater importance in the United States than it is in Canada, but the greater part of the catch is used for home consumption, although a certain quantity of canned fish is exported. The fisheries may be divided similarly to those of Canada, *viz.*, (1) The Atlantic, (2) the Pacific, and (3) Inland fisheries. In the north-east, *i.e.*, the Atlantic, stretching from Newfoundland to Chesapeake Bay, the cod, herring, mackerel, haddock and halibut catches are the most important. followed by lobsters and oysters, whilst in the north-west (Washington and Oregon) salmon fishing in the Columbia river is pre-eminent, with an important branch in Alaska. The inland lake and river fisheries supply trout, whitefish, sturgeon and other varieties.

Agricultural Products

Agriculture takes a very important place in the industries of the United States. The leading crops are maize, wheat, oats, tobacco and cotton, the country being the world's largest producer of maize, cotton, oats and tobacco, and being second to the U.S.S.R. as a wheat producer.

Wheat, the second most important cereal in point of acreage, but the third in quantity produced, is cultivated in two main areas: (1) the northern spring wheat belt of the Dakotas, Montana and Minnesota, a continuation of the main Canadian wheat belt; and (2) the winter wheat belt farther south, which lies south of the maize or corn belt (see below) and north of the cotton belt, *i.e.*, roughly between the Arkansas and Ohio rivers. The crop is also grown in the north-west coast States of Washington and Oregon, in the Mediterranean region of California and in the north-east. The most important wheat-producing States are North Dakota, Kansas and Washington, followed by Montana, Oklahoma, Nebraska, Ohio and Illinois.

The United States export only about 5 per cent. of their total wheat production, due to the increasing demands for home consumption, and it is probable that in the near future they will find it necessary to import additional supplies from Canada. Even now, in years of poor harvest, as in 1934, there is none available for export. The export routes, which, naturally, are losing much of their importance, are (1) for the northern States from Duluth and Milwaukee (*a*) *via* the Great Lakes and by rail, or (*b*) wholly by rail *via* Chicago, to the Atlantic ports of New York, Baltimore, Boston and other ports ; (2) for the winter wheat belt (*a*) *via* the Mississippi or (*b*) by rail, to the Gulf ports ; (3) for the north-west States *via* Portland and the Puget Sound ports ; and (4) for Californian wheat *via* San Francisco.

MAIZE, known as " corn," is grown in enormous quantities in the United States, where it occupies nearly twice the area devoted to wheat. It is the typical crop of the Central States south of the wheat belt, because it requires more moisture and a hotter summer than wheat. Iowa is the leading producer, followed by Nebraska, Illinois, Minnesota, Missouri, Indiana and Ohio. In spite of the vast quantity produced, only a very small proportion of the output is exported, since nearly the whole of it is used for fattening cattle, pigs, and poultry—the maize belt being the chief cattle and pig rearing area of the country. The great maize-marketing and meat-packing centres of the region are Chicago, Kansas City and St. Louis.

COTTON is the leading export by value of the United States, the production of raw cotton amounting to between 55 and 60 per cent. of the world output. The crop is grown mainly in the south-east, in the region corresponding mainly with the Gulf type of climate. The three main areas of production are the " black earth " region of Texas, the " alluvial bottoms " of the lower Mississippi and the " black belt " of Alabama. The islands off Georgia and S. Carolina, as well as the adjacent coastal districts, have a relatively small but important output of " sea island " cotton, noted for its long staple.

The leading cotton States are Texas (the most important), Georgia, Mississippi, Alabama, South Carolina, Oklahoma, Arkansas, North Carolina and Louisiana.

In spite of the increasing importance of its cotton manufacturing industry, the United States export about 50 per cent. of their cotton crop, mainly to European countries (particularly Great Britain), Japan and China. The American cotton growing industry suffers from a great disadvantage in that it is subject to a pest known as the " boll weevil," which has from time to time destroyed many acres of the crop. It has proved very difficult to eradicate, in spite of the most up-to-date scientific methods (including spraying of the fields from aeroplanes), and has caused a shifting of the main cotton belt westward.

(Further details concerning wheat, maize and cotton have been given in Chapters 10 and 11.)

TOBACCO is cultivated in a belt lying between and overlapping the eastern parts of the maize and cotton belts, the leading States being North Carolina, Kentucky and Tennessee. The United States at present produce over one-third of the total world output. The exports are sent overseas mainly from Richmond in Virginia, and the leading tobacco market is Louisville in Kentucky.

OTHER PRODUCTS—*Oats*, *rye* and *barley* are grown in the Atlantic and Lake States; *sugar-beet* in New York, Utah, Ohio, Michigan, Colorado and California; *rice*, under irrigation, in Texas, Louisiana and California; and *sugar-cane* in the swampy plains of Louisiana and Texas. Hay and other fodder crops are grown in large quantities in different parts of the country. Small quantities of oats, rye, barley and rice are exported.

Fruits, mainly of the sub-tropical variety, are important both for home consumption and for export. California produces the usual Mediterranean fruits, especially oranges and grape fruits, and prepares considerable quantities of both canned and dried fruits for the home market and for export to Europe. Florida is noted particularly for its oranges and pineapples, and of the former especially it exports large quantities. The north-west States produce apples for export to Europe and, in the densely populated districts of the north-east, apples and vegetables are widely grown for home consumption.

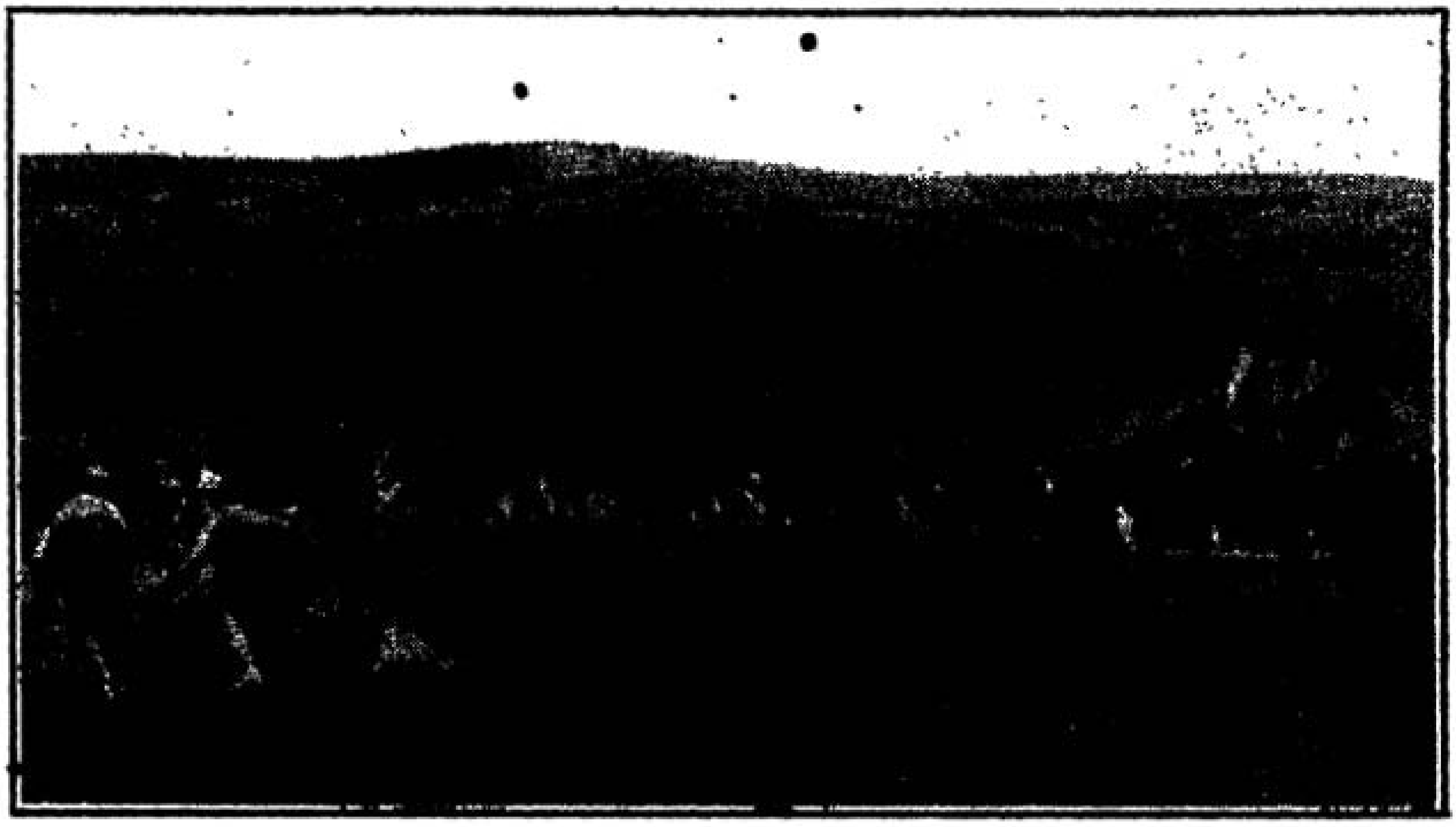
Pastoral Industries

The great ranching areas of the United States are situated west of the crop-producing regions, where the land is too dry for arable farming owing to its position in the rain-shadow of the Rocky Mountains. The leading ranching area is in the middle West States (Montana, Wyoming and Texas), the last-named State having the greatest number of both sheep and cattle. The importance of cattle and pigs in the maize belt has already been mentioned: large numbers of cattle reared in the Middle West are sent here for fattening.

In recent years there has everywhere been a great increase in mixed farming and, throughout the north-east States especially, dairy produce and poultry farming have become increasingly important. The cooler and moister climate of the north-east gives rise to rich pastures, whilst the great industrial centres of this region provide a ready market for the products of the dairying industry.

The mountain States of the North-west, where the climate is drier and the pastures less nutritive, are the most important sheep-rearing areas. Montana, Wyoming and Idaho are the leading sheep-rearing States, whilst there are considerable numbers of sheep in regions which are too dry for cattle, as in New Mexico. The quality of the wool produced is not very high and the total production is much below local requirements.

On balance, the United States are importers of pastoral products. There is an export of pork, but beef exports have almost ceased, whilst large quantities of hides and skins have to be imported to satisfy the requirements of the enormous leather industry of the country.



[Photo by W. F. Taylor.

BRANDING CATTLE IN MONTANA, U.S.A.

Mining

From the point of view of output, the United States as a whole leads the world in mineral production, having the largest output of such important minerals as coal, iron, petroleum, copper, lead, zinc, aluminium and salt; the second largest output of silver and the third largest output of gold. The only notable minerals in which the country is deficient are tin and nickel.

COAL is the most important mineral. The chief field, and the one which produces the greater part of the total coal output, is that of the Appalachian Mountains, which stretches from Pennsylvania to Alabama and is the largest single field worked in the world. Much of the coal is easily worked as it lies near the surface. Eastern Pennsylvania is an important anthracite region, whilst the remainder of the Appalachian coal is bituminous. The presence of this coalfield has given rise to important industrial areas centred on Pittsburgh in the north, and on Birmingham (in Alabama) in the south.

In the middle west there are two fields, one in Illinois, Indiana and West Kentucky, and the other stretching from Iowa to Arkansas. Comparatively small fields are worked in Michigan, Oklahoma, Texas, Wyoming, Colorado, California, Oregon, Washington and in the western part of the Gulf region in the south-east. (See Fig. 107 in Chapter 12.)

Only a relatively small proportion (about 4 per cent.) of the United States' coal output is exported, the greatest export being over the Canadian border across the Great Lakes to the coalless but highly industrialised parts of Ontario and Quebec.

OIL follows coal in importance among United States minerals, but the volume of output from the different centres of production varies frequently and considerably as the wells become exhausted, or as new wells come into use. At present the greatest output is obtained from Oklahoma, Texas and California. In the Appalachian region, formerly the most important producing area but now being gradually exhausted, the chief States concerned are Illinois, Indiana and Ohio.

The United States at the present time produce over 60 per cent. of the world's oil. A great deal is used in home consumption but there is also an important export, while crude oil is imported from Mexico and South America for refining and re-export. The oil is conveyed to the ports by pipe lines, and is carried overseas in specially equipped tankers.

IRON is mined in large quantities in different parts of the States, and the total obtained amounts to about one-third of the total world production. The greatest output (about 85 per cent. of the total) is obtained from Minnesota, Wisconsin and Michigan, mainly from the Marquette and other mountains bordering Lake Superior, and, as is to be expected, the Lakes are used as the chief means of transporting the ore to the smelting centres—a most important point in view of the fact that these rich haematite deposits are a long way from the principal coalfields. Around and near Birmingham, in Alabama, iron is found in conjunction with coal, and this led to the development in the region of a highly important iron and steel industry. Local supplies of iron are now quite inadequate, and much has to be obtained elsewhere—chiefly from the Lake Superior mines.

PRECIOUS METALS AND STONES.—*Gold* is obtained mainly from California, Alaska, South Dakota, Colorado, Utah and Nevada, while *silver* comes from Utah, Idaho, Montana, Arizona, New Mexico, Colorado and Nevada. A variety of *precious stones* also is found.

COPPER is mined chiefly in Arizona, Montana, Michigan, Utah and Nevada. The United States are important producers of copper (but see p. 138) and hold the enviable position of being the only important industrial country in the world which has large copper resources.

OTHER METALS in which the United States hold a leading world position are *lead*, obtained from the Joplin district of Missouri, Idaho and Kansas, and, mined with silver, in Idaho and Utah; *zinc*, from the Joplin district, with lesser centres in Wisconsin, Colorado and Idaho; and *bauxite* (aluminium ore), from Arkansas.

Manufactures

The manufacturing districts lie mostly in the east, because here are found both raw materials and power, the greatest density of population, which provides both abundant labour and an adequate home market, and an excellent system of transport. The notable feature of American manufactures is the remarkable development of mass production and of the use of standardised parts. Details of the leading manufactures of the country will be found in Chapter 14 and in the following pages which deal with the natural regions.

NATURAL REGIONS OF THE UNITED STATES

It is possible to divide the country into twelve broad natural regions on the basis of climatic and topographical differences: (1) the New England States, (2) the Atlantic Coastal Plain, (3) the Appalachian Region, (4) the Gulf Coastal Plain, (5) the Middle Mississippi Basin, (6) the Upper Mississippi Basin, (7) the North Middle West, (8) the South Middle West, (9) the Rockies, (10) the South-West Deserts, (11) the North-West, and (12) California.

The New England States

This region comprises the States of Massachusetts, Connecticut, Rhode Island, Maine, Vermont and New Hampshire, and consists of the northern section of the Appalachians. As the States lie in the east they are subject to off-shore winds and thus have cold winters and warm summers, with a rainfall well-distributed throughout the year and mainly of the cyclonic type.

Fishing has long been an important industry of the region; *Portland*

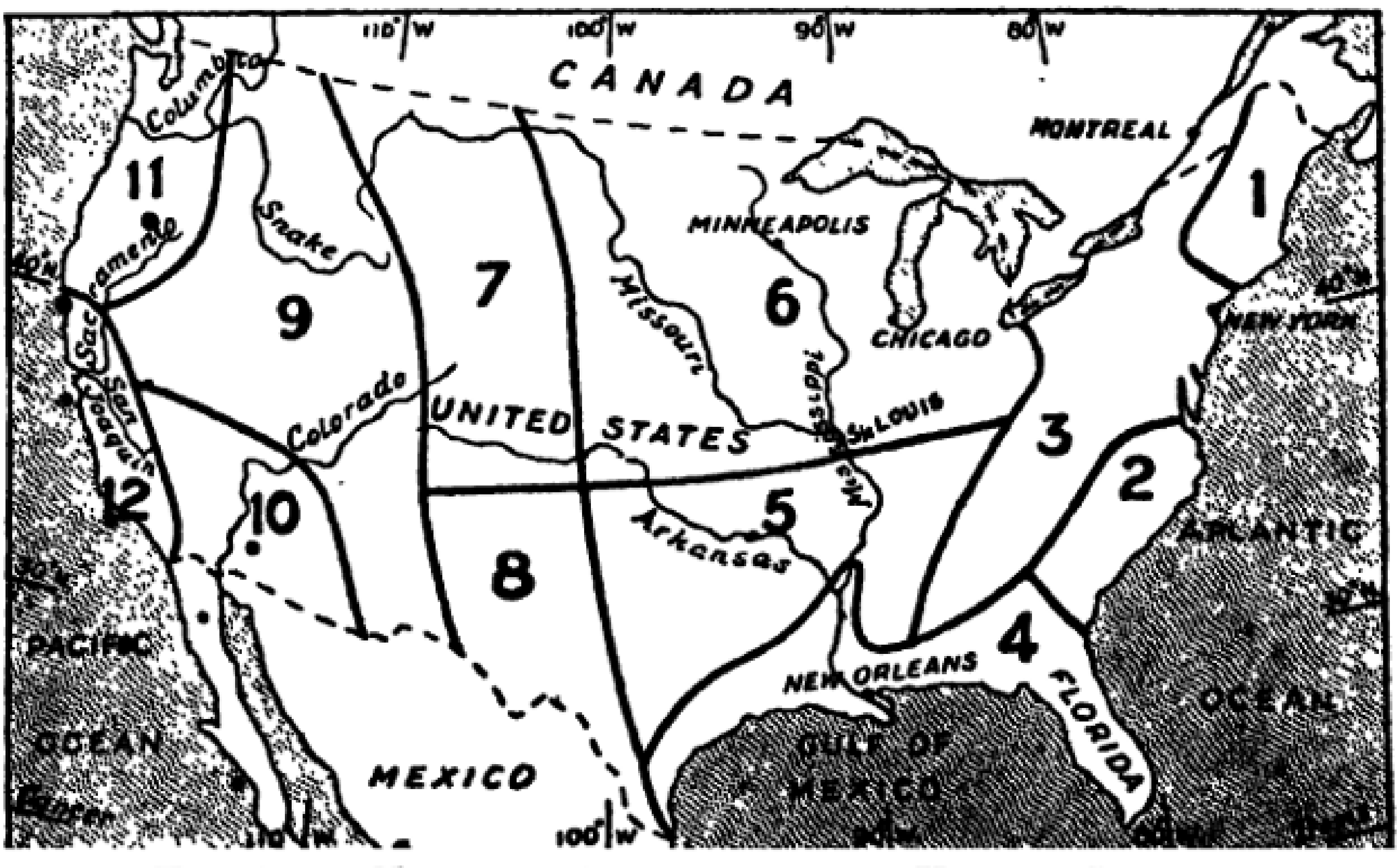


FIG. 190. NATURAL REGIONS OF THE UNITED STATES

and *Gloucester* are the chief ports engaged, while cod, herring, haddock and mackerel are the principal catches. In Chesapeake Bay, there are valuable oyster beds.

Arable farming has declined in face of competition from the Middle West and to-day the chief agricultural pursuits are dairying, fruit-farming and vegetable-growing, for which the industrial centres provide a ready market.

Although the region is lacking in both coal and iron, it is one of the principal manufacturing areas in the United States. The power provided by the numerous rivers was a cause of the early development of industries, while the easy sea facilities for the import of raw materials and the export of the finished products gave a further stimulus. To-day, coal is obtained from Nova Scotia and Pennsylvania.

Textiles are the chief manufactures, the damp climate being especially suitable for the cotton industry. Massachusetts is the leading cotton manufacturing State, the main centres being *Fall River* and *Lowell*. *Manchester*, in New Hampshire, and *Providence*, in Rhode Island, are other centres. Massachusetts is also the principal seat of the woollen industry, Boston being the greatest wool market of North America.

The raising of cattle in the interior beyond the Mohawk Gap and the availability of tanning material from local oak forests have given rise to an important leather industry round Boston, where the manufacture of boots and shoes is the most important in the United States. The manufacture of wood pulp in Massachusetts and Maine is due to the presence of extensive soft-wood forests and plentiful water supplies, while the fact that metal industries grew up in the early days explains their presence to-day throughout the region, *e.g.*, Waterbury watches. The canning of meat, vegetables and fish also is important in this area, whose dependence for both raw materials and markets on the Mohawk Gap cannot be over-estimated.

Boston, the chief port of the region and the second port of the United States, lies north of New York and west of Cape Cod. It is at a considerable disadvantage compared with New York because there is no complete gap in the mountains giving access to its hinterland. Nevertheless, it has a large trade, importing raw materials, such as wool and leather, and exporting the manufactured products of the industrial centres of New England, *e.g.*, motor-cars and iron and steel goods. It is also an important industrial centre.

The Atlantic Coastal Plain

This region, extending southwards from Baltimore, has mild winters and hot summers with rain well distributed throughout the year, tending towards a summer maximum. Agriculture is the main occupation, with cotton, tobacco and maize the chief crops. *Charleston*, in the south, and *Wilmington*, on Cape Fear River further north, are cotton ports.

In this region, particularly in Virginia, the Carolinas and Georgia, the manufacture of cotton has assumed importance in recent years. Local supplies of raw cotton, coal from the Birmingham district of the Appalachians, cheap labour and a favourable climate have all combined to create the industry. So rapidly has the industry spread, that it is now the leading cotton textile centre of the United States, having outstripped the older centre in New England.

The Appalachian Region

This region lies to the south of the New England States and west of the Atlantic Plain. The rainfall is lower than on the coast and decreases towards the west, while average temperatures also are lower.

Agriculture is not important, except towards the south, and much food has to be sent from the south and west of the United States. In the valleys to the north, oats and wheat are the chief crops, with dairying prominent in New York State. In the south, cotton and tobacco are cultivated in the sheltered valleys.

The importance of the region is due mainly to its vast mineral wealth. Pennsylvania, in the north, produces half the total coal mined in the United States, while there are smaller, yet nevertheless important, fields in Ohio, West Virginia, Kentucky and Alabama. Some iron is found in Pennsylvania and Alabama, but local resources are small and are supplemented by supplies from the Lake Superior region. As a result of the wealth of coal, the Appalachian region has become highly industrialised. *Pittsburgh* (Pennsylvania), lying at the head of navigation on the River Ohio, is the greatest iron and steel centre in the world; other important centres are *Youngstown*, *Cleveland* and *Buffalo* in the north and *Birmingham*, in Alabama. Cleveland, on Lake Erie, has an iron and steel industry and is important for the building of lake steamers, while Buffalo, on Lake Erie, near the Niagara Falls, has railway construction and repair shops and is a lake and rail terminal port, transhipping timber, grain and ore from the west and manufactures from the east.

Woollen, leather and silk manufacture are important, while minor industries include the manufacture of wood-pulp and paper, chemicals (at *Newark*, New Jersey), the refining of sugar and petroleum and printing. *Akron*, in Ohio, is noted for its rubber and printing industries.

New York, magnificently situated on a fine harbour, is the largest city and the chief port of the United States, and the second city of the world (*see* p. 228).

Philadelphia, at the head of the estuary of the Delaware, is the second city in the United States and is an important manufacturing town, chiefly concerned in iron and steel, textiles, leather, carpets and clothing.

Baltimore, at the head of Chesapeake Bay, is an important grain and tobacco port. It has wool and leather industries and is an educational centre.

The Gulf Coastal Plain

The climate of this region is somewhat similar to that of the Atlantic Coastal Plain, but average temperatures are higher and the climate has monsoonal tendencies. The Mississippi delta and its immediate hinterland is the chief division of the region and is the most important cotton growing region in the world. Sugar-cane and rice are also important products of Louisiana. Florida has an important fruit-growing industry, with oranges, lemons, grape-fruit and pineapples outstanding. Along the west coast of the peninsula are valuable deposits of phosphates. Coal is mined in north-western Texas, which also possesses important mineral oil deposits. The coasts of Florida are important fishing grounds, sponges being particularly important.

New Orleans, an important ocean port at the head of the delta of the Mississippi and some distance upstream, owes its growth mainly to its exports of cotton and oil from the productive hinterland, which extends over the whole Mississippi Valley. As a cotton marketing and collecting centre it is of world importance. *Galveston*, in the west of the region, is the largest cotton-exporting port in the world. The oil from the Mid-Continent fields is sent by pipe-line to the Gulf ports of New Orleans, *Baton Rouge, Houston and Port Arthur*, which have large oil-refining industries.

The Middle Mississippi Basin

This region extends from the Gulf Plain to St. Louis. Mild winters, hot summers and a plentiful and well-distributed rainfall characterise the region. The whole area was once forested and although much of the land has been cleared, timber is an important product. The principal crops are cotton and tobacco. In the Ozark Plateau are large deposits of lead and zinc, and Arkansas is the chief source of bauxite in the United States.

Memphis, on the Mississippi in Tennessee, is a manufacturing and marketing centre.

The Upper Mississippi Basin

This is a region with cold winters, hot summers and summer rains. It is known popularly as the " Middle West " and is the most important farming area in the United States, for it includes the tobacco belt, the maize, cattle and pig belt and the winter wheat belt in the south, the spring wheat belt in the north-west and the mixed farming region around the Great Lakes. Lumbering is an important occupation in Michigan and Wisconsin, and there is also enormous mineral wealth in the region, including the large copper and iron deposits near the Lakes, coal (chiefly in Illinois and Iowa) and petroleum (Ohio, Indiana and Illinois). The resources of foodstuffs, raw materials and minerals have made the region the second most important manufacturing area of the country, particularly in connection with food products, and the slaughtering, meat-packing and by-products industries constitute the most important in value of all the industries of the United States. Other industries include the manufacture of iron and steel, chiefly on the shores of the Lakes (*e.g.*, at Chicago and *Milwaukee*), leather, wireless instruments, flour and lumber products. The large markets available have been an important factor in the development of the food industries, whilst the mixed farming area has developed owing to the hillier structure and the poorer soils, which are more suited to pastoral than to arable farming.

Minneapolis is a noted flour-milling centre situated on the St. Anthony Falls and at the head of navigation of the Mississippi.

St. Paul, its " twin " city ten miles lower down the river, shares with Minneapolis the distinction of being the natural centre of the spring wheat belt. *Duluth* and *Superior* are important grain ports on Lake Superior.

Chicago (see p. 228), the chief town of the region, is a lake port on the southern shore of Lake Michigan, with excellent railway communication with all parts of the country. In addition to the industries already mentioned, it manufactures large quantities of agricultural implements.

St. Louis, just south of the confluence of the Mississippi and the Missouri, is an important railway centre, being also concerned in meat-packing, in iron and steel and tobacco manufacture, and in the marketing of grain and cattle from the north-west plains.

Kansas City, at the junction of the Kansas with the Missouri, also is a railway and a meat-packing centre.

The North Middle West

To the west of the Mississippi basin lies a high plain region consisting for the most part of the eastern foothills of the Rockies. The northern part of this area suffers great extremes of temperature and has a low rainfall which occurs mainly in summer and which makes irrigation and dry-farming necessary for crop cultivation. Spring wheat is the outstanding crop and sugar-beet is extensively cultivated. Ranching is a most important occupation, the millions of cattle and sheep which roam the high plains providing supplies for the meat slaughtering and packing centres further east.

The mineral wealth is considerable, but has not been fully developed. Lignite is found in North Dakota and gold, silver and lead in South Dakota.

The South Middle West

This region has a climate similar to the preceding region, of which it is a continuation, but with higher winter temperatures and a heavier rainfall. There is little arable farming, but ranching is extremely important, particularly in Texas.

The Rockies

This highland region extends through the states of Montana, Idaho, Wyoming, Utah, Colorado and New Mexico. Agriculture is of little importance, being confined to the river valleys. In Utah, however, the sugar-beet is widely grown with the aid of irrigation. Sheep-rearing is important on the lower slopes. The mineral wealth of the region is considerable. Coal is found in isolated areas, but the principal minerals are the non-ferrous metals (*see* p. 612).

In northern Utah lies the Great Salt Lake, with *Salt Lake City*, a railway and agricultural centre and the main seat of the Mormon sect, on its south-east shore.

The scenery of the Rockies, particularly the Colorado Springs and the Yellowstone National Park of Wyoming, attracts many tourists.

The South-West Plateau Deserts

In Nevada and Arizona, between the Rockies and the west coast ranges, lies the desert region of the United States, including the Colorado Desert in the south. Although the soil is generally fertile, the extremes of temperature and the extremely low rainfall militate against agriculture. Sheep-rearing is the chief occupation. Minerals include gold, lead and mercury (Nevada). In the north of Arizona is the Grand Canyon National Park, a favourite tourist resort.

The North West

The States of Washington and Oregon are co-extensive with the Pacific Forest Region of British Columbia and have climatic features and productions similar to that region (*see* pp. 595 and 605).

Seattle, on Puget Sound, is the chief town and port. It exports timber and has a fish-canning industry.

Portland, on the Willamette, a tributary of the Columbia River, can be reached by ocean steamers. It is a western outlet for wheat and has timber industries.

California

California corresponds broadly to the Mediterranean region of the United States. It consists of the fertile Californian Valley, drained by the Sacramento and San Joaquin Rivers, and is enclosed by the Coastal Ranges on the west and the Sierra Nevada on the east. At San Francisco, the Coastal Range is broken through by the Golden Gate, thus providing an outlet for the wealth of the region. The northern part has a greater and more evenly distributed rainfall than typical

Mediterranean regions. Elsewhere, the rainfall is most abundant on the seaward slopes of the Coastal Range. Inland, the rainfall has to be supplemented by extensive irrigation.

Barley, wheat and rice are widely grown in the Californian Valley under irrigation, but the principal agricultural product is fruit from the irrigated areas of the dry and sunny region in the south of the Valley. Apricots, peaches, plums, pears and cherries are all grown, and these form the basis of an extensive fruit-canning industry. Lemons, oranges, grape-fruit and raisins are equally important, oranges and grape-fruit being exported in large quantities. In the north, where the rainfall is more abundant, the slopes are covered with forests, giving rise to a timber industry.

The mineral wealth is abundant, although coal is lacking. California is a leading State for the production of gold and petroleum, in addition to being an important producer of copper. Manufactures are not important owing to the absence of coal and the distance of the State from the most densely populated regions of the United States.

San Francisco has a fine harbour and is the main outlet for California (*see* page 230). *Sacramento* is an important collecting centre in the valley, while *Los Angeles*, the largest town, outside the valley on the south-west coast, is the outlet for the oilfields. It is also the centre of the important cinema film industry.

Tourist centres include the famous Yosemite Valley, a national park, in the Sierra Nevada opposite San Francisco, and the coastal resorts, such as Long Beach, in the south.

Communications and Commerce

Although well-endowed with waterways, the United States have not such a magnificent system as that of Canada. Entrance to the interior by water from the east is secured by the utilisation of the Hudson-Mohawk valley up to Lake Erie. The Hudson river is navigable from New York to Albany, whence the Mohawk valley is followed by an important and much-used canal which takes the vessels into Lake Erie. From Albany there is also canal connection with Montreal *via* Lake Champlain and the Richelieu valley. Since the advent of railways the volume of river traffic on the Mississippi and its tributaries has fallen considerably. The river, though wide, is only suitable for vessels of shallow draught, and floods and silt are a constant hindrance to navigation. Most of the rivers flowing to the east coast are navigable throughout their courses over the plain areas, but the west coast is singularly lacking in navigable waterways.

Railway development, fostered by the existence of vast tracts of cheap, level land and of abundant building material, has been rapid and extensive, so that there is now a considerable network of lines throughout the country, but particularly in the east. The trans-continental lines are described in Chapter 18 and reference should be made to Chapter 19 for the air routes.

The chief *exports* of the United States are cotton, machinery, petroleum, motor-cars, fruits, tobacco, iron and steel goods, cotton goods, coal and lard. The main *imports* are raw silk, coffee, paper, hides, skins, sugar and rubber. Trade is carried on mainly with Canada, Britain, Germany, Japan, France, Argentina, China and Australia.

MEXICO

Area : 767,198 sq. miles ; *Population :* 16 500,000.

Mexico lies between the United States and Central America, with the Pacific Ocean to the west and the Gulf of Mexico to the east.

Physical Features and Climate

The Rocky Mountains continue south from the United States and are represented by several ranges, of which the *Sierra Madre* on the west attain the greatest altitude, enclosing a plateau which covers the greater part of the country. As is the case in the United States and Canada, the land slopes more gradually to the east than to the west, leaving a narrow coastal plain in the west but a fairly wide plain in the east, the greatest area of lowland being the peninsula of Yucatan in the south, which projects into the Gulf and encloses the Bay of Campeche. In the north-west lies the desert peninsula of Lower California and the narrow north-west coastal desert. The rivers of Mexico are generally short and rapid and of little use as means of communication.

The climate varies with differences in latitude and altitude. In the north, rainfall is deficient because this region lies in the permanent high pressure belt situated just north of the Tropic. Rainfall increases with decrease in latitude, the southern part being under the influence of the North-East Trade winds which bring rain to the eastern coastal lands and slopes. The south-west is cut off from the influence of the Trades, but in summer monsoonal rains occur owing to the heat of the land. The plateau is robbed of much moisture by the bordering mountains. Temperature varies with altitude. Lowlands up to 3,000 ft. in height are hot ; from 3,000 ft. to 7,000 ft. the climate is temperate ; whilst above 7,000 ft. occurs the cold zone.

Natural Regions and Resources

Excluding the west coast region, which economically is unimportant, there are three broad natural divisions of the country based on relief, *viz.*, (1) the Gulf Coastlands, (2) the Temperate Hill Slopes, and (3) the Western Plateau, known as *tierra caliente* (hot zone), *tierra templada* (temperate zone) and *tierra fria* (cold zone), respectively.

THE GULF COASTLANDS, around the Bay of Campeche, as a result of their tropical climate, produce sugar, cocoa, rubber, tobacco, vanilla, coconuts and bananas. The Yucatan Peninsula is the world's chief producer of sisal hemp or henequen, which is exported mainly to the United States.

Vera Cruz is the most important port of Mexico and has a cotton manufacturing industry. *Tampico*, about 250 miles to the north on the estuary of the Panuco, is rapidly increasing in size. These are Mexico's leading ports for the export of petroleum, which is found immediately behind the coastal plain.

THE TEMPERATE HILL SLOPES consist of those lands below 5,000 ft. in height. Here cotton, wheat, maize and coffee are cultivated, and sheep and cattle are reared.

THE PLATEAU is noted chiefly for its mineral wealth and mining is the leading industry. The country is the first of the world's silver producers, third as a lead producer, fifth as a producer of copper and gold and seventh as a producer of petroleum. Iron is widely distributed but is little exploited, while coal deposits occur in the north and zinc also is found.

Some wheat and maize and the greater part of Mexico's cotton output are grown on the plateau with the aid of irrigation, but conditions are more favourable for pastoral farming, which is practised on large ranches known as " haciendas."

Mexico City, centrally situated on the plateau, is the capital, and, together with *Puebla* (about 50 miles to the south-east), is responsible for most of the cotton and woollen manufactures of the country. *Monterey* and *San Luis Potosi* are large mining centres, while the former has large iron and steel works.

Communications and Commerce

All the inland towns are connected by railway to the ports and are linked up with the United States. The railway system is remarkably efficient considering that immense physical difficulties have had to be overcome.

Mexico's chief *exports* are silver, gold, petroleum, copper, lead, zinc, hides, skins, coffee and henequen. Its *imports* consist mainly of machinery, coal and textile goods. About 75 per cent. of the trade is with the United States.

THE BERMUDAS

Area : 19·3 sq. miles ; *Population :* 29,000.

The Bermudas, a British Colony, are an isolated group of coral islands situated in the Atlantic nearly 600 miles from the North American coast and about midway between the West Indies and Nova Scotia. The damp heat of the summer is very oppressive, but the mild, healthy winter climate has caused the islands to become a popular American and

Canadian winter resort, and the tourist industry is the mainstay of the colony.

Potatoes, onions and lily bulbs find a ready market in New York and trade is almost exclusively carried on with the United States. The capital and chief town is *Hamilton*, an important British naval base and a bunkering station for coal and oil.

QUESTIONS ON CHAPTER 29

1. Write a short account of the mineral industry and mineral resources of Canada. (*I. of B., Pt. I*, 1930)
2. Draw a rough sketch-map of the basin of the Mississippi, showing its chief tributaries and the more important towns along its banks. Indicate the importance of the river *either* in the history of the United States *or* in the economic life of the United States of to-day. (*C.I.S. Prelim., Dec.*, 1931)
3. What are the principal exports of the Dominion of Canada? State from what parts of Canada they come and mention any geographical factors which influence their production. (*C.I.S. Prelim., Dec.*, 1931)
4. Describe shortly the main physical features of North America showing their relation to the climate of the continent. (*R.S.A., Stage I*, 1930)
5. Draw a sketch map of Canada and mark on it:—
   1. The Rocky Mountains.
   2. The River St. Lawrence with the Great Lakes.
   3. Wheat-growing Areas.
   4. The Fruit-growing Areas.
   5. Chief Lumbering Areas.
   6. The chief Salmon-fishing Districts.
   7. Winnipeg, Calgary, Vancouver, Ottawa, Quebec. (*C.C.S. Prelim., May*, 1931)
6. Discuss the comparative influences of ocean currents on the climate and commercial advantages of Great Britain and of the New England States respectively. (*I.C.W.A. Prelim., Dec.*, 1931)
7. (*a*) What are the chief vegetable and mineral products of Canada?
   (*b*) Give a short account of the Province of Quebec. (*L.A.A. Prelim., Dec.*, 1930)
8. "The mission of New Brunswick in the history of the world is to connect Quebec Province with the far Eastern provinces and with Europe."

   Explain this statement. (*L.A.A. Prelim., Dec.*, 1929)
9. The "Canadian Pacific" claims to be the "world's greatest travel system." Give reasons in support of this claim. (*L.A.A. Prelim., June*, 1931)
10. EITHER (*a*) What has been the importance of railways in the development of Canada?

    OR (*b*) What do you know of the climate and conditions of life in Northern Canada? What possibilities does it offer for future development? (*C.I.S. Prelim., Dec.*, 1930)

11. Describe briefly the appearance of the country in Canada immediately to the east of the Rockies and compare it with that of British Columbia. What are the principal products of the two regions? (*C.I.S. Prelim., June*, 1931)

12. Give a geographical account of the maritime provinces of Eastern Canada. (*I. of B., Qual.*, 1931)

13. Give a brief geographical account of a railway journey from Montreal to Vancouver. (*I. of B., Qual.*, 1928)

14. Draw a large sketch-map of Canada. Insert the transcontinental railways with the names of six chief places which they serve. Show by shading and the words TIMBER, WHEAT, FISH, where these commodities are obtained. Write a brief account of the chief occupations of the people who live on or near the shores of the Great Lakes. (*L.C. of C., June*, 1928)

15. What and where is Alberta, what is the principal product supplied by it to Great Britain, and what are the geographical circumstances favouring or hindering its production and export? (*I. of B., Pt. I*, 1928)

16. Among the exports from North America to Great Britain are included fruit, wheat, meat, fish. Choose any THREE of these articles and state in regard to each (*a*) the conditions under which it is produced in North America, (*b*) the route by which it is brought to this country, and (*c*) any steps taken in preparing the article for export to reduce the bulk or to prevent deterioration. (*C.S., May*, 1929)

17. Divide Canada into its main climatic zones, describing and explaining the characteristics and economic products of each. (*C.S., March*, 1925)

18. On a map of the North Atlantic Ocean name Cuba, Nova Scotia, and Labrador. Mark, name and underline in black *two* important ports closed by ice in winter, and mark, name and underline in red *two* open all the year round. Shade *one* important fishing ground, marking and naming a port connected with the industry. Mark and name an island port of call for vessels proceeding to the South Atlantic. (*C.S., April*, 1930)

19. Both lumbering and wheat farming in Canada are of importance to the people of the British Isles. Choose *one* of these occupations and say (i) why it is important to the people of these islands, (ii) where *in Canada* it is carried on. (iii) Describe the life and work of the people engaged in it. (*C.S., September*, 1928)

20. Set out facts to show to what extent the commercial development of the United States of America has been assisted or hindered by (*a*) relief, (*b*) rivers, (*c*) natural vegetation. (*L.M., Jan.*, 1931)

21. Contrast the British Columbia region of Canada and the Gulf Plain of the United States with regard to relief, rainfall, resources and industries. (*L.M., June*, 1926)

22. Show that the area of the United States from Maine to Florida which drains into the Atlantic is varied in relief, climate and industries. (*L.M., June*, 1929)

23. State and comment on the situation of the chief coalfields and the chief manufacturing areas of the United States. (*I. of B., Pt. II*, 1927)

24. Compare the climate and products of the eastern and western seaboards of the United States, latitude for latitude. (*I. of B., Pt. II*, 1928)

CHAPTER 30

THE WEST INDIES; CENTRAL AND SOUTH AMERICA

THE WEST INDIES

The West Indies comprise the whole of the important group of islands that extends from the southern and south-eastern coasts of the United States towards South America. The four large islands in the north—CUBA, HAITI, JAMAICA and PORTO RICO—are called the GREATER ANTILLES, whilst the long chain of smaller islands to the east and south-east is called the LESSER ANTILLES. This chain is subdivided into two groups: the LEEWARD ISLANDS in the north, and the WINDWARD ISLANDS in the south. In addition, there are the BAHAMAS, an entirely British group of low coral islands to the south-east of Florida and to the north of the Greater Antilles.

The islands are, for the most part, very mountainous. They experience a uniformly high temperature throughout the year and the North-East Trades, here blowing almost from due east, in conjunction with the mountainous nature of the relief, cause rain to fall at all seasons, though mainly in summer, when the relief rains are reinforced by convectional rains. The leeward slopes, particularly in winter, are relatively dry. Hurricanes, or violent tropical cyclones, occur during August, September and October, and often cause great destruction. In spite of such drawbacks, the climate is generally very pleasant and the islands are popular as health resorts.

The vegetation is of the dense tropical type, and between the mountain spurs which run down to the coasts lie valleys of great beauty and fertility. The products of the islands are mainly agricultural and typically tropical. They include cane sugar and its derivates—molasses and rum; tropical fruits, such as bananas, oranges and pineapples; tobacco; valuable woods; coffee and cocoa.

British West Indies

JAMAICA (*area:* 4,674 sq. miles: *population:* 1,000,000), including the TURKS ISLANDS, the CAYMAN ISLANDS, the CAICOS ISLANDS and other small islands, is the most important British West Indian possession. The land rises from the sea to the Blue Mountains in the centre, from which several streams flow, but only the Black River is navigable.

Fruits (bananas and oranges), sugar, rum, coconuts, coffee and cocoa are the main products and exports, whilst there is also much valuable timber. There are about 200 miles of railway and many good roads.

The principal ports, all connected by rail, are *Kingston* (the capital), *Spanish Town*, *Montego Bay* and *Port Antonio*, the latter being the principal port of the fruit trade. *Grand Turk* is the capital of the Turks and Caicos Islands, and *Georgetown* of the Cayman Islands.

TRINIDAD AND TOBAGO (*area :* 1,976 sq. miles : *population :* 420,000), situated off the coast of Venezuela, export cocoa, petroleum, asphalt and sugar. Asphalt is obtained from a large natural pitch lake (Lake Brea) in Trinidad. *Port of Spain*, the capital, on the Gulf of Paria, has one of the finest harbours in the West Indies. It acts as entrepôt for Venezuela.

BARBADOS (*area :* 166 sq. miles : *population :* 180,000), lying east of the Windward Islands, exports large quantities of sugar and molasses. *Bridgetown* is the capital.

THE BAHAMAS (*area :* 4,404 sq. miles : *population :* 62,000) include a large number of islands, most of which are uninhabited. The most important island is NEW PROVIDENCE. The principal industry is sponge-gathering, and sponges form one of the most important exports. Tomatoes are the leading exports by value, whilst timber, shells and sisal hemp (for rope making) also are exported. *Nassau*, the capital, on New Providence Island, has a fine harbour. In the group is WATLING ISLAND (SAN SALVADOR), on which Columbus landed on 12th October, 1492.

THE LEEWARD ISLANDS (*area :* 715 sq. miles : *population :* 130,000) include, in addition to the British possessions, a number of islands which belong to France and the Netherlands. Strictly speaking, the islands are incorrectly named since they lie directly in the path of the North-East Trades.

The British possessions comprise ANTIGUA, BARBUDA AND REDONDA (capital *St. John's*), producing sugar, molasses, cotton, and pineapples ; ST. KITTS (capital *Basseterre*), NEVIS (capital *Charlestown*) and ANGUILLA (capital *Roa*), producing sugar, syrup, cotton, coconuts and salt ; MONTSERRAT (capital *Plymouth*), producing lime-juice, cotton, sugar, bay oil (from limes) and cottonseed meal ; DOMINICA (capital *Roseau*) producing lime juice, other lime products, cocoa, coconuts, copra and fruits ; and the BRITISH VIRGIN ISLANDS (capital *Road Town*, on Tortola Island), producing sugar, tobacco, coconuts, cotton and pineapples.

THE WINDWARD ISLANDS (*area :* 516 sq. miles : *population :* 188,000) are all British, and include GRENADA and the GRENADINES (capital *St. George's*), producing cocoa, nutmegs, mace and cotton ; ST. VINCENT (capital *Kingstown*), producing sea-island cotton, arrowroot, cocoa, sugar, molasses, rum, copra and spices ; and ST. LUCIA (capital *Castries*, with the finest harbour in the West Indies and an important coaling station), producing sugar, molasses, rum, cocoa, lime-juice, honey, logwood and fruits.

Cuba

Cuba, a republic, is the largest of the West Indian Islands. It has an area of 44,164 sq. miles and a population of 3,650,000. The east is mountainous, but elsewhere the surface is an undulating plain. Cuba is one of the world's chief producers of cane-sugar, and this and tobacco constitute the staple products of the island as well as the principal exports. In recent years, the production of cane sugar has been restricted by presidential decree, but the product still supplies 70 per cent. of the total exports. The island is attempting to overcome the disadvantages attaching to dependence on one main " export " crop by extending the cultivation of other products. Thus, the production and export of coffee is rapidly increasing. Other products and exports are fruits (pineapples, bananas, citrus fruits and coconuts) and minerals (iron, copper, manganese and gold). Cocoa, cereals and potatoes also are produced, while timber and timber-products are important.

Havana, the capital, has a fine harbour, and is a remarkably well-planned town. There are numerous tobacco factories in the town, Havana cigars being, of course, world-famous.

Other Islands of the West Indies

HAITI and DOMINICA, both republics, form the western and eastern parts respectively of the island of Haiti or San Domingo. Haiti has an area of 10,204 sq. miles and a population of about 2½ millions. The area of Dominica is 19,332 sq. miles and the population about 1,200,000. The main products are sugar, coffee, cocoa and tobacco, whilst there are considerable undeveloped mineral and timber resources.

The principal town of Haiti is *Port au Prince*, which has an excellent harbour. The chief town of Dominica is *Santo Domingo*.

GUADELOUPE (population 270,000) and MARTINIQUE (population 240,000) are French possessions producing sugar, rum, bananas, coffee and cocoa.

The chief town of Guadeloupe is *Basse-Terre*, and that of Martinique is *Fort-de-France*.

LEEWARD ISLES. This is another group of so-called Leeward Islands which lies off the north coast of Venezuela (South America), and must be carefully distinguished from the Leeward Islands in the Lesser Antilles. The islands under consideration here are in the lee of the Lesser Antilles and are therefore appropriately named.

Curacao, the most important, belongs to the Dutch, as do several of the other islands in this group. It produces maize, beans, pulses, cattle, salt, phosphate of lime and orange oil. The population is 75,000 and the chief town is *Willemstad.*

PORTO RICO belongs to the United States. It has an area of 3,435 sq. miles and a population of 1½ millions. The main products are sugar, coffee, tobacco, pineapples, grape fruits and oranges, all of which are exported. The principal towns are *San Juan* and *Ponce.* The island of CULEBRA has a good harbour.

THE VIRGIN ISLANDS of the United States include ST. THOMAS (32 sq. miles), ST. JOHN (19 sq. miles), ST. CROIX (82 sq. miles), and about 50 small islands mainly uninhabited. The population is 22,000. Bay rum and bay oil are the principal products. *St. Thomas*, the capital, is an important coaling and oil-fuelling station.

CENTRAL AMERICA

The narrow neck of Central America, connecting the North and South American continents, consists of the small and largely undeveloped republics of GUATEMALA, SALVADOR, HONDURAS, NICARAGUA, COSTA RICA and PANAMA, together with the British Crown Colony of BRITISH HONDURAS. The whole of this region, comprising an area of over 215,000 English square miles, lies within the Tropics.

The surface of the land is mountainous for the greater part and, like the American continents generally, slopes from west to east. The west coast, bounded by the Pacific, is precipitous and has been the scene of great volcanic activity, but the east coast, washed by the Caribbean Sea, is low and swampy.

The climate ranges from that of the hot coastal lowlands to that of the cooler interior highland areas. The whole of this region has abundant rainfall, which is received mainly in summer, with the larger amount on the Atlantic coast as that area is permanently under the influence of the North-East Trade winds. Much of the land is covered by dense tropical forests in the hotter parts, and by temperate forests in the cooler areas. In the latter, there are also grasslands suitable for the rearing of cattle, while almost everywhere the soil is fertile.

Guatemala

(*Area :* 42,367 sq. miles ; *population :* 2,200,000.)

The republic of Guatemala is the most northerly of the States of Central America. From west to east runs a mountain chain, the *Cordilleras*, which contains several volcanic peaks. The Pacific slope is the most fertile and densely populated area. The climate is tropical, with heavy coastal rains, but on the whole is not unhealthy.

Minerals are present but are undeveloped. Coffee is by far the most important export (about 75 per cent. of the total) followed by bananas, timber, sugar and chicle-gum. Maize, rice and beans are cultivated for local consumption. Nearly 50 per cent. of the imports consist of textiles.

Guatemala, the capital, situated at an altitude of 4,800 ft., is connected by rail with the Pacific port of *San José de Guatemala* and, *via* the valley of the *Motagua River*, with the Atlantic port of *Puerto Barrios*.

Salvador

(*Area* : 13,176 sq. miles ; *population* : 1,500,000).

Salvador, extending along the Pacific coast of Central America, consists of a narrow coastal plain and an inland mountainous region containing several volcanic peaks, the neighbourhood of which has, in recent years, been subject to frequent earthquakes. The climate in the lowland regions is hot and unhealthy, but that of the higher interior, thanks to its altitude, is more temperate.

Agriculture is the foremost industry and the chief crop is coffee, which comprises about 90 per cent. of the value of all the exports. Other products are henequen and balsam (both exported), cane-sugar, maize, cacao, tobacco, indigo, rubber and valuable timbers. There are many undeveloped minerals. Cottons, hardware, flour, drugs and chemicals are the main imports.

San Salvador, the capital, is connected by rail to *Acajutla*, the principal port.

Honduras

(*Area* : 44,275 sq. miles ; *population* : 860,000).

The republic of Honduras has a coastline of nearly 400 miles on the Caribbean Sea, but of only about 40 miles on the Pacific Ocean. The country is mountainous, and though the soil is fertile there are large tracts of uncultivated land. The coastal lowlands are hot and damp, but the higher lands are more healthy.

Bananas are the leading product. These are cultivated along the Atlantic Coast, and exported mainly to the United States. Coconuts, coffee, tobacco and sugar also are cultivated and exported. There is much mineral wealth, gold, silver, copper and lead being exported.

The forests are extensive but largely undeveloped ; they yield valuable mahogany, which is sent mainly to the United States. Conditions are favourable on the highlands for the rearing of cattle, which is being encouraged by the Government.

Straw hats and cigars are the chief manufactures, while textiles and other manufactures form the chief imports.

The capital is *Tegucigalpa*, situated inland, while the chief ports are *Trujillo* and *Puerto Cortes* on the Atlantic coast, and *Amapala* on a small island off the Pacific coast.

Nicaragua

(*Area :* 51,660 sq. miles ; *population :* 750,000).

Nicaragua, the largest republic in Central America, has a long coastline on both the Atlantic and the Pacific. The low eastern part has a hot, wet climate, but the higher areas of the west are cooler and drier. The principal products and exports are coffee (about 60 per cent. of the total exports), timber, bananas, gold, sugar, hides and skins, but production is backward owing to the dearth of labour and lack of communications. The imports are similar to those of Salvador.

Managua, the capital, situated on Managua Lake, was almost totally destroyed by earthquake in March, 1931. The principal Atlantic ports are *Bluefields* and *Greytown* while those of the Pacific coast are *Corinto* and *San Juan del Sur*. The Pacific ports are the more important. Managua has rail connection with Corinto.

Costa Rica

(*Area :* 23,000 sq. miles ; *population :* 540,000).

Costa Rica, extending across the narrower part of Central America, is a mountainous republic, in which temperature and rainfall decrease westward from the hot and wet Atlantic coast. The soil is fertile, producing mainly coffee and bananas, which account for nine-tenths of the total exports. Other exports are cocoa, timber, precious metals, hides, skins and fruits. The leading imports are cotton, flour, motorcars, iron and steel, mineral ore and silk goods.

San José is the capital, and the chief ports are *Limon* on the Atlantic coast, and *Punta Arenas* on the Pacific. These ports are linked by a railway through the capital.

Panama

(*Area :* 32,380 sq. miles ; *population :* 470,000).

The republic of Panama, the most southerly of the Republics, is as yet undeveloped. The interior is mountainous with a cool climate which is in distinct contrast to the hot, moist and unhealthy climate of the coastal plains. The soil is extremely fertile but only a small part is properly cultivated, while over one-half of the land is unoccupied.

The most important product is the banana, which accounts for two-thirds of the total exports. Other exports are coconuts, cocoa, ivory nuts, coffee, balata, hides, mother-of-pearl, gum, tortoise-shell and timber. Cottons and other manufactures, together with flour and other foodstuffs, are the chief imports.

Panama, the capital, and *Colon* are linked by a railway and are situated respectively at the Pacific and Atlantic termini of the Panama Canal (see p. 320 and Fig. 153), on either side of which is a strip of land five miles wide leased in perpetuity to the United States.

[*Photo by Ewing Galloway, N.Y.*

THE PANAMA CANAL.

A fine view of Pedro Miguel Locks, with the Gaillard Cut (formerly Culebra) in the distance and Miraflores in the foreground. A large steamship is leaving one of the locks for Miraflores on its way to the Pacific.